

TOPEKA REGIONAL AIRPORT & BUSINESS CENTER BILLARD AIRPORT

PROJECT MANUAL

for

FOE FUEL FARM

AIP Project No. 3-20-0113-045

AT

TOPEKA REGIONAL AIRPORT

January 13, 2023

Prepared By:

wsp

WSP USA Inc. 300 Wyandotte Suite 200 Kansas City, Missouri 64105

CERTIFICATION PAGE

I am responsible for the following drawings and specifications:

Drawings:

A001	CS201	CD203
A002	CS202	CG101
A003	CS203	CG102
G003	CS204	CG103
C110	CS205	CG104
C111	CS206	CG105
C112	CS207	CG106
C113	CS208	CG107
C114	CD201	CG108
CD110	CD202	CG109

Specifications:

Revisions to COT Specifications included in the Supplementary Provisions

C-105

P-605

F-162

F-163



Each professional whose signature and personal seal appears above assumes responsibility in these bidding documents only for what is listed above and disclaims any responsibility for all other plans, specifications, estimates, reports, or other documents or instruments not sealed by the signed professional relating to or intended to be used for any part or parts of the project.

CERTIFICATION PAGE

I am responsible for the following drawings and specifications:

Drawings:

G001, G002, C001, C101, CD101, CD102, CD103, CD104, CS101, CS111, CS411, CS412, CS421, CS422, CS431, CS432, CS441, CS451, CS501, CS502, CS503, CS504, CS505, CJ101, CJ201, CJ501, CJ502, CJ503, CU101, CU102, CU201

Specifications:

01 11 00.00	01 25 00.00	01 26 20.00	01 33 00.00
01 78 00.00	02 00 00.00	02 41 19.00	02 61 00.00
02 65 00.00	02 83 13.00	03 30 00.00	31 00 00.00
32 13 73.16	33 41 00.02		



Jared M. Tate (SEAL)

I am responsible for the following drawings and specifications:

Drawings:

S001, S002, S003, SS101, SS201, SS202, SS203, SS501, SS502, SS503, SS504, SS511, SS512



Rhett M. Johnson (SEAL)

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CERTIFICATION PAGE

I am responsible for the following drawings and specifications:

Drawings:

M001, MS101, MS102, MS103, MS104, MS301, MS302, MS303, MS304, MS305, MS306, MS401, MS402, MS403, MS501, MS502, MS503, MS504, MS600, MS601, MS602, MS603, MS604, MS606, MS607, MS608, MS609

Specifications:

09 97 13.00	33 52 43.00	33 52 43.11	33 52 43.13
33 52 43.15	33 52 43.16	33 52 43.21	33 52 43.23
33 52 43.24	33 52 43.28	33 52 43.31	33 56 43.15
33 56 43.17			



Aaron G. Mickelson (SEAL)

I am responsible for the following drawings and specifications:

Drawings:

E001, ES101, ES110, ES120, ES201, ES202, ES203, ES204, ES501, ES502, ES503, ES504, ES505, ES506, ES507, ES601, ES602, ES603, ES604, ES605, ES701, ES702, ES703, ES704, ES705

Specifications:

26 05 00.00 26 05 33.13 26 22 00.00 26 43 00.00 40 70 00.00	26 05 19.00 26 05 33.16 26 24 16.00 26 56 00.00	26 05 26.00 26 05 53.00 26 28 16.16 33 71 19.00	26 05 29.00 26 21 00.00 26 32 13.00 40 60 00.00	SEAN SWEENEL	
Sean P. Sweer	ney	(SE	AL)	ANSAS	

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FOE Fuel Farm
Topeka Regional Airport
AIP 3-20-0113-045

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REQUESTS FOR BIDS / INVITATION FOR BIDS (Advertisement)

METROPOLITAN TOPEKA AIRPORT AUTHORITY FOE FUEL FARM TOPEKA REGIONAL AIRPORT TOPEKA, KANSAS AIP PROJECT NO. 3-20-0113-045

Sealed bids will be received until 10:00 AM (CDT) February 27th, 2023, and then publicly opened and read at Metropolitan Topeka Airport Authority Administrative Offices, 6510 SE Forbes Avenue, Suite # 1, Topeka, Kansas 66619 for furnishing all labor, materials and equipment and performing all work necessary for FOE Fuel Farm, Topeka Regional Airport, Topeka, Kansas, AIP Project No. 3-20-0113-045.

Copies of the bid documents including project drawings and technical specifications are on file and may be inspected at:

Metropolitan Topeka Airport Authority 6510 SE Forbes Avenue, Suite # 1 Topeka, KS 66619

A "pdf" copy of the project construction drawings and project manual will be provided via e-mail to prospective bidders upon request and at no cost by contacting the project manager at the address provided below or via e-mail. Printing of the project documents from the pdf file are to be borne by the prospective bidder.

Sam Stallbaumer, PE, Project Manager WSP USA 300 Wyandotte, Suite 200 Kansas City, Missouri 64105 TEL: 816-702-4244 MOB: 210-867-6532 E-Mail: sam.stallbaumer@wsp.com

A pre-bid conference for this project will be held at **Metropolitan Topeka Airport Authority Administrative Offices, 6510 SE Forbes Avenue, Suite # 1, Topeka, Kansas on Wednesday, February 08, 2023 at 2:00 PM**. Representatives of the Owner and the Engineer will be present to answer questions. Attendance at the pre-bid conference is **mandatory**.

Each proposal must be accompanied by a bid guarantee in the amount of five (5) percent of the total amount of the bid. The bid guarantee may be by certified check, cashier's check or bid bond made payable to the **Metropolitan Topeka Airport Authority**.

Bids may be held by the Metropolitan Topeka Airport Authority for a period not to exceed ninety (90) days from the date of the bid opening for the purpose of evaluating bids prior to award of contract.

The right is reserved, as the Metropolitan Topeka Airport Authority may require, to reject any and all bids and to waive any informality in the bids received.

This project is subject to the requirements of the Davis-Bacon Act, as amended. The Contractor is required to comply with wage and labor provisions and to pay minimum wages in accordance with the schedule of wage rates established by the United States Department of Labor.

This project is subject to the requirements of 49 CFR Part 26 Disadvantaged Business Enterprise Participation. The owner has established a contract goal of nine percent (9.0%) participation for small business concerns owned and controlled by qualified disadvantaged business enterprises (DBE). The

bidder shall make and document good faith efforts, as defined in Appendix A of 49 CFR Part 26, to meet the established goal.

The CONTRACTOR agrees to commence on or about April 1, 2023, and to have the project substantially completed within 330 Calendar Days from the Notice-to-Proceed.

The bidder acknowledges and accepts that for each and every Calendar Day the project remains incomplete beyond the contract time of performance, the substantial completion date, or not open to traffic as stipulated in the preceding paragraphs of this section, the CONTRACTOR shall pay the non-penal amount of \$3,600.00 per day as a liquidated damage to the OWNER.

All persons seeking to enter into a contract with the Metropolitan Topeka Airport Authority shall submit and acceptable affirmative action program in accordance with Federal Regulations.

Bidders shall take note of requirements for notification of Disadvantaged Business Enterprise (DBE).

Award of contract is also subject to the Federal provisions provided for in the section of the project manual entitled "Federal Contract Provisions for Construction and Equipment Contracts".

END OF REQUEST FOR BIDDERS

NOTICE TO BIDDERS

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CONTRACT WORK ITEMS. This project will involve the following work items and estimated quantities. Prospective bidders are hereby advised that the quantities indicated herein are approximate and are subject to change per the Section 40 of the General Provisions.

Item No.	Description	Unit	Quantity
1	Temporary Seeding and Mulching	Acre	0.4
2	Installation and Removal of Silt Fence	LF	988
3	Installation and Removal of Inlet Protection	Ea	1
4	Installation and Removal of Ditch Check	LF	80
5	Mobilization	LS	1
6	Traffic Control	LS	1
7	Pavement Removal	SY	2,461
8	Cold Milling (0" to 4")	SY	4,662

Item No.	Description	Unit	Quantity
9	Clearing and Grubbing	LS	1
10	Unclassified Excavation	CY	544
11	Contractor Furnished Material	CY	1,544
12	Embankment	CY	1,779
13	6" Aggregate Base - Type AB-3	SY	3,283
14	Bituminous Surface Course	Ton	1,140
15	10" Non-Reinforced Dowel Jointed Concrete Pavement	SY	2,661
16	10" Reinforced Concrete Pavement	SY	622
17	Tack Coat	Gal	236
18	7' Chain-Link Fence with Barbed Wire, Complete	LF	1,382
19	Vehicle Gate, Manual Sliding (22' Wide)	Ea	1
20	Vehicle Gate, Manual Sliding (26' Wide)	Ea	1
21	Vehicle Gate, Manual Sliding (27' Wide)	Ea	1
22	Vehicle Gate, Manual Sliding (30' Wide)	Ea	1
23	Vehicle Gate, Manual Sliding (31' Wide)	Ea	1
24	Pedestrian Swing Gate (6' Wide)	Ea	2
25	Removal of Existing Fence, Complete	LF	448
26	Installation and Removal of Temporary Fence	LF	1,108
27	Removal of Existing Gates	Ea	1
28	Aggregate Mow Strip	LF	1,382
29	Anti-Burrow Barrier	LF	997
30	18" Storm Sewer (RCP), (Class IV)	LF	231
31	24" Storm Sewer (RCP), (Class IV), W/Pipe Collar	LF	16
32	18" End Section (RC)	Ea	2
33	Type II-P Area Inlet	Ea	3
34	Modify Sanitary Sewer Manhole	Ea	1
35	Seeding, Fertilizing and Mulching	Acre	0.4
36	Construct New Fuel Facility Complete	LS	1
37	Decommission and Demolition of Both Existing Fuel Facilities	LS	1

CONTRACT TIME. The anticipated date that project work may commence on or about **April 1, 2023.** The owner has established a contract time of 330 Calendar Days. All project work shall be substantially completed within the stated timeframe. This project is subject to liquidated damages as prescribed within the project manual.

BID GUARANTEE. Each proposal must be accompanied by a bid guarantee in the amount of five (5) percent of the total amount of the bid. The bid guarantee may be by certified check or bid bond made payable to <u>Metropolitan Topeka Airport Authority</u>.

BONDING REQUIREMENTS. The successful bidder will be required to furnish separate performance and payment bonds each in the amount equal to 100% of the contract price at the time of contract execution.

AWARD OF CONTRACT. All proposals submitted in accordance with the instructions presented herein will be subject to evaluation. Bids may be held by the <u>Metropolitan Topeka Airport Authority</u> for a period not to exceed <u>ninety (90) days</u> from the date of the bid opening for the purpose of evaluating bids prior to award of contract.

Award of contract will be based on the lowest aggregate sum proposal submitted from those bidders that are confirmed as being responsive and responsible. The right is reserved, as the <u>Metropolitan Topeka</u> <u>Airport Authority</u> may require, to reject any and all bids and to waive any informality in the bids received.

Prospective Bidders are hereby advised that award of contract is contingent upon the owner receiving Federal funding assistance under the Airport Improvement Program.

PROJECT SCHEDULE AND LIQUIDATED DAMAGES. The CONTRACTOR agrees to commence and to have the project substantially completed on the FOE Fuel Farm project within 330 Calendar Days after the Notice-to -Proceed.

The bidder acknowledges and accepts that for each and every Calendar Day the project remains incomplete beyond the contract time of performance, the substantial completion date, or not open to traffic as stipulated in the preceding paragraphs of this section, the CONTRACTOR shall pay the non-penal amount of \$3,600.00 per calendar day as a liquidated damage to the OWNER.

FEDERAL PROVISIONS. This project is subject to the following partial listing of Federal provisions, statutes and regulations:

<u>Equal Employment Opportunity</u> - Executive Order 11246 and 41 CFR Part 60: The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth within the supplementary provisions. The successful Bidder shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin.

Goals for Minority and Female Participation – Executive Order 11246 and 41 CFR Part 60:

- 1. The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth within the supplementary provisions.
- 2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

<u>Timetables:</u>	
Goals for minority participation for each trade:	9.0%
Goals for female participation in each trade:	6.9%

These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its Federally involved and non-federally involved construction.

<u>Certification of Non-Segregated Facilities – 41 CFR Part 60</u>: A certification of Non-Segregated Facilities must be submitted prior to the award of a federally-assisted construction contract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

Contractors receiving federally assisted construction contract awards exceeding \$10,000, which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the

forwarding of the notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. The penalty for making false statements in offers in prescribed in 18 U.S.C. 1001.

<u>Disadvantaged Business Enterprise – 49 CFR Part 26</u>: The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted contracts. In accordance with 49 CFR Part 26.45, the sponsor has established a contract goal of <u>nine percent (9.0%)</u> participation for small business concerns owned and controlled by certified socially and economically disadvantaged enterprise (DBE). The bidder shall make and document good faith efforts, as defined in Appendix A of 49 CFR Part 26, to meet this established goal.

<u>Davis-Bacon Act, as amended – 29 CFR Part 5:</u> The Contractor is required to comply with wage and labor provisions and to pay minimum wages in accordance with the current schedule of wage rates established by the United States Department of Labor.

<u>Debarment, Suspension, Ineligibility and Voluntary Exclusion – 49 CFR Part 29</u>: The bidder certifies, by submission of a proposal or acceptance of a contract, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Individuals or companies listed in the General Services Administration's "Excluded Parties Listing System" will not be considered for award of contract.

Foreign Trade Restriction – 49 CFR Part 30

The Bidder and Bidder's subcontractors, by submission of an offer and/or execution of a contract, is required to certify that it:

- a. Is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);
- b. Has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;
- c. Has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Buy American Certificate – Aviation Safety and Capacity Act of 1990:

This contract is subject to the "Buy American Preferences" of the Aviation Safety and Capacity Act of 1990. Per Title 49 U.S.C. Section 50101, all steel and manufactured products installed under an AIP assisted project must be produce in the United States unless the Federal Aviation Administration has granted a formal waiver. As a condition of bid responsiveness, Bidders must submit the appropriate Buy American certification with their proposal.

ADDITIONAL PROVISIONS. A complete listing of the provisions applicable to this project can be found in the Supplemental Provisions.

MODIFICATION OF DOCUMENTS. Modification to the project documents may only be made by written addendum by the Owner or Owner's authorized Representative.

The proposal must be made on the forms provided within the bound project manual. Bidders must supply all required information prior to the time of bid opening.

SUBMITTAL OF PROPOSALS. Additional information and instruction for submittal of a proposal are provided within the Instructions-to-Bidders. Envelopes containing bids must be sealed and addressed to:

Hand Delivery of Proposals:	Metropolitan Topeka Airport Authority 6510 SE Forbes Avenue, Suite # 1 Topeka, KS 66619 TEL: 785-862-2362
Mail Delivery of Proposals:	Metropolitan Topeka Airport Authority P.O. Box 19053 Topeka, KS 66619

The upper left-hand corner of the sealed envelope must identify the following information:

CONTRACT PROPOSAL

Bid of {Insert Name of Bidder} FOE Fuel Farm AIP Project No.: 3-20-0113-045 To be opened at: 10:00 AM, February 27, 2023

END OF NOTICE TO BIDDERS

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INSTRUCTIONS TO BIDDERS

OWNER AND OWNER'S REPRESENTATIVE. The Owner as stated herein refers to the following agency **Metropolitan Topeka Airport Authority.** The Owner's authorized representative as stated herein refers to the Owner's Consultant **WSP USA Inc.** herein referred to as Engineer.

SUCCESSFUL BIDDER. The term "Successful Bidder" means the lowest, qualified, responsible Bidder to whom the Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

BIDDER REPRESENTATIONS. By submittal of a proposal (bid), the BIDDER represents the following:

- The Bidder has read and thoroughly examined the project documents
- The Bidder has a complete understanding of the terms and conditions required for the satisfactory performance of project work.
- The Bidder has familiarized themselves of the requirements of working on an operating airport, has fully informed themselves of the project site conditions and the surrounding area, and has visited the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the work.
- The Bidder has studied and carefully correlated Bidder's observations with that of the project documents.
- The Bidder has found no errors, conflicts, ambiguities or omissions in the project documents, except as previously submitted in writing to the owner that would affect cost, progress or performance of the work.
- The Bidder is familiar with all applicable Federal, State and local laws, rules and regulations pertaining to execution of the contract and the project work that may in any manner affect cost, progress or performance of the Work.
- The Bidder has complied with all requirements of these instructions and the associated bid documents.

BID DOCUMENTS/PROJECT MANUAL. The bid documents are comprised of the following; Notice-to-Bidders, Instructions-to-Bidders, Supplementary Provisions, General Provisions, Technical Specifications, Project Drawings, Proposal Form with attachments, Form of Contract Agreement, any authorized addenda issued by the Owner and any document incorporated in whole or in part by reference therein.

All documents comprising the Bid Documents are complementary to one another and together establish the complete terms, conditions and obligations of the successful bidder.

Those individual elements of the Contract Documents that are bound together shall also be referred to as the Project Manual. No part of the project manual that is bound may be removed or detached.

Complete set of Bid Documents shall be used in preparing Bids; neither the Owner nor the Engineer assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents/Project Manual.

Prospective bidders may obtain a copy of the project manual and project drawings from the designated office identified within the Notice-to-Bidders.

Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

MODIFICATIONS TO BID DOCUMENTS. Modifications to the bid documents may only be made by written addendum issued by the Owner or the Engineer. Verbal explanations, interpretations or comments made by the Owner or Owner's representative shall not be binding. Addenda will be transmitted to all known official plan holders. Each bidder shall certify at the time of bid submittal that they acknowledge receipt of all issued addenda.

ERRORS AND DISCREPANCIES IN BID DOCUMENTS. Should Bidder find an error, discrepancy, ambiguity or omission in the bid documents prior to submittal of a proposal, the Bidder is obligated to contact the Owner or the Engineer with written notice of the error, discrepancy, ambiguity or omission. The written notice shall identify the nature and location of the error, discrepancy, ambiguity or omission. Corrections or modifications to the project documents will only be made by written addendum as prescribed herein. By submittal of a Bid Proposal, Bidder represents that they have thoroughly reviewed the bid documents and that they have not identified any error, discrepancy, ambiguity or omission that would affect cost, progress or performance of the project work.

CLARIFICATIONS AND INTERPRETATIONS. A bidder requiring a clarification or interpretation of the bid documents shall make a written request to the Owner or Engineer. The Owner or Engineer must receive the written request a minimum of ten (10) calendar days prior to the date of the bid opening. All questions and answers will be posted to the Bid Event. Questions and answers that result in a material changed to the scope of work or quantities will require issuance of an addendum. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

INTERPRETATIONS OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be accomplished and materials to be furnished under these specifications is stated within the project manual. This estimate is a result of careful calculations and is believed to be correct. The estimated quantities are given only as a basis for comparison of proposals and the award of contract. The Owner does not expressly or impliedly agree that the actual quantities involved will correspond exactly with the estimated quantities.

The Bidder shall not plead misunderstandings or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as hereinafter provided in the subsection titled "Alteration of Work and Quantities" of the general provisions without in any way invalidating the unit bid prices.

SUBSTITUTE MATERIAL AND EQUIPMENT. The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to the Engineer, application for such acceptance will not be considered by the Engineer until after the "Effective date of the Agreement". The procedure for submittal of any such application by Contractor and consideration by Engineer is set forth in the General Provisions.

EXAMINATION OF CONTRACT DOCUMENTS, PLANS, SPECIFICATIONS AND SITE CONDITIONS. As stated within the "Bidder Representations" and reaffirmed herein, the Bidder is expected to carefully examine the Contract Documents, visit the site of the proposed work, examine the proposal, drawings, specifications, terms and conditions of the proposed agreement and the form of agreement and familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of Work.

The Bidder shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished and as to the requirements of the proposed contract. The submission of a

proposal shall be prima facie evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans and specifications.

Boring logs and other records of subsurface investigations and tests, as appropriate may be available for inspection by the Bidder. It is understood and agreed that such subsurface information, whether included in the project drawings, specifications or otherwise made available to the Bidder, was obtained and is intended for the owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that the Bidder is solely responsible for all assumptions, deductions, or conclusions which he or she may make from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

These reports are not guaranteed as to accuracy or completeness, nor are they part of the Bid Documents. Before submitting the Bid each Bidder will, at his own expense, make such additional investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Bid Documents.

On request Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid.

The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Specifications or Drawings.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement described and that the Bid Documents are sufficient in scope and detail to indicate and convey understanding of all terms, and conditions for performance of the Work.

ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should the bidder be in default for any of the following reasons:

- Failure to comply with any pre-qualification regulations of the owner, if such regulations are cited or otherwise included, in the proposal as a requirement for bidding.
- Failure to pay, or satisfactory settle, all bills due for labor and materials on former contracts in force (with the owner) at the time the owner issues the proposal to a prospective bidder.
- Contractor default under previous contracts with the owner
- Unsatisfactory work on previous contracts with the owner

BID PROPOSAL FORM. All bid proposals shall be made on the forms provided by the Owner within the bound Project Manual. No bidder may submit more than one proposal. All proposals are to be written in ink and shall be clearly legible. All blank spaces in the proposal forms shall be legibly completed for each and every bid item. The Bidder shall not qualify any bid item. The Bidder shall initial any erasures and alterations made on the proposal form by the bidder.

The Bidder shall state the price of their bid in U.S. dollars and cents in both written and numeral format. In the event of a discrepancy, the written value will take precedence.

SIGNATURE OF PROPOSAL. The proposal shall be signed and dated by an authorized representative of the Bidder. All signatures shall be made with an ink pen. The Bidder's representative shall have the legal authority to obligate and bind the Bidder to the terms and conditions of the contract. The Bidder shall legibly state the name of the Bidder's representative, the legal name of the Bidder, the address of the Bidder including City, State and Zip Code, and the telephone number of the Bidder.

Bids submitted by an agent, evidence of the power of attorney shall be attached to the bid.

MODIFICATION OR WITHDRAWAL OF BID PROPOSAL. Bidder may modify or withdraw their proposal at any point up to the specified time and date identified for receipt of proposals. Any request for

bid withdrawal or modification by the Bidder that is received after the specified time and date for receipt of proposals will be returned unopened to the sender.

Any modification to a Bidder's proposal, subject to the time constraint noted herein, must be made on the proposal forms contained in the project manual. The Bidder's authorized representative must sign the modification. The modification shall be placed in a sealed envelope and the statement "Modification to Proposal" shall be legibly marked in the upper left-hand corner. Withdrawal of a proposal may be made, subject to the time constraint noted herein, only with written confirmation under signature of the Bidder.

BID GUARANTEE. Each bid proposal must be accompanied by a Bid Guarantee, to be made payable to the Owner, in the amount of five percent (5%) of the Bidder's maximum Bid price (including alternates) and in the form of a certified check, cashier's check or bid bond issued by the Surety meeting the requirements of the General Provisions. The bid bond shall be from a responsible surety qualified to conduct business within the State of Kansas. A certified check shall be issued from a responsible and solvent bank or trust company. All forms of Bid guarantee must be delivered in original form. Facsimile transmissions of Bid guarantee documents will not be accepted.

SUBCONTRACTORS, ETC. Bidder must submit to Owner, as part of their Bid Form, a complete list of all Subcontractors and other persons and organizations (including those who will be furnishing the principal items of material and equipment) proposed to be used by the bidder to complete this project. Failure by the Bidder to provide this list with his bid shall render the bid nonresponsive. If requested by the Owner, the Successful Bidder shall submit to the Owner, in writing, an experience statement with pertinent information as to similar projects and other evidence of qualifications for each such Subcontractor, person and organization listed on the Bid Form. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, other person or organization, either Owner or Engineer may before giving the award of contract, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid Price. If the apparent Successful Bidder declines to make any such substitution, the contract shall not be awarded to such Bidder, but his declining to make any such substitution will not constitute grounds for sacrificing his Bid Guarantee. Any Subcontractor, other person or organization so listed and to whom Owner or Engineer does not make written objection prior to the giving the award of contract, will be deemed acceptable to Owner and Engineer. Substitutions to this list of acceptable Subcontractors and other persons and organizations after the apparent Successful Bidder has been awarded a contract by the Owner will not be allowed without the written approval of the Owner or Engineer.

No Contractor shall be required to employ any Subcontractor, other person or organization against whom he has reasonable objection.

The amount of the Work performed by Subcontractors in aggregate shall not exceed seventy (70) percent of the Total Bid. A contract will not be awarded to a bidder not in compliance with this requirement.

DISADVANTAGE BUSINESS ENTERPRISE (DBE). The requirements of 49 CFR Part 26, Regulations of the U.S. Department of Transportation, apply to this contract. It is the policy of the Metropolitan Topeka Airport Authority to practice nondiscrimination based on race, color, sex or national origin in the award or performance of this contract. All firms qualifying under this solicitation are encouraged to submit bids/proposals. Award of this contract will be conditioned upon satisfying the requirements of this bid specification. These requirements apply to all bidders, including those who qualify as a Disadvantaged Business Enterprise.

The Owner has established a DBE contract goal of **nine (9) percent** for this contract. The Bidder/Offeror shall make good faith efforts, as defined in Appendix A, 49 CFR Part 26, to subcontract **nine (9) percent** of the dollar value of the prime contract to certified DBE firms as defined in 49 CFR Part 26.

All bidders shall submit the following information with their proposal on the forms provided:

The names and addresses of DBE firms that will participate in the contract,

A description of the work that each DBE firm will perform,

The dollar amount of the participation of each DBE firm participating,

Written documentation of the Bidder/Offeror's commitment to use a DBE subcontractor whose participation it submits to meet the contract goal.

Evidence of good faith efforts undertaken by the bidder, as described in appendix A to 49 CFR Part 26.

The successful Bidder will be required to provide written confirmation from the participating DBE firms verifying their intent to participate as in the project. This written confirmation shall be submitted along with the proposal documents as a condition of bid responsiveness.

GOOD FAITH EFFORTS (DBE). Bidder must demonstrate that they made good faith efforts to achieve participation with DBE firms. This requires that the bidder show that it took all necessary and reasonable steps to secure participation by certified DBE firms. Mere pro forma efforts will not be considered as a good faith effort.

Actions constituting evidence of good faith efforts are described in appendix A to 49 CFR Part 26. Such actions include but are not limited to:

- Soliciting DBE participation through all reasonable and available means. This may include public advertisements and phone calls/faxes to known certified DBE firms.
- Consult State Department of Transportation office to obtain a list of certified DBE firms.
- Selecting portions of work that increases the likelihood that DBE firms will be available to participate
- Providing DBE firms with sufficient information and time to review the project plans and specifications.
- Documenting all contacts with DBE firms. This includes name, address, phone number, date of contact and record of conversation/negotiation.

BIDDER QUALIFICATIONS. Each Bidder shall furnish the owner satisfactory evidence of their competency and financial capability to perform the proposed work. The Bidder shall demonstrate that they are a responsible firm that possesses the skills, abilities, and integrity to faithfully perform the project work. To be determined responsible, a prospective contractor must:

- Have adequate resources (financial, technical, etc.) to perform the contract, or the ability to obtain them.
- Have previous experience and evidence of authority to conduct business in the jurisdiction where the Project is located and evidence of Bidder's qualification to do business in the State of Kansas or covenant to obtain such qualification prior to award of the contract.
- Be able to comply with the required or proposed delivery or performance schedule, considering all existing business commitments.
- Have a satisfactory performance record.
- Have a satisfactory record of integrity and business ethics.
- Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

Evidence of competency shall consist of statements covering the Bidder's past experience on similar work, a listing of plant and equipment immediately available for use on the project, and a listing of key personnel that are available for the project. The listing for plant and equipment shall identify the type, the capacity and the present condition of the item.

Evidence of financial responsibility shall consist of a confidential statement or report of the Bidder's financial resources and liabilities as of the last calendar year. A public accountant must certify such statements and reports. If the Bidder is presently pre-qualified with the State Highway agency, evidence of this pre-qualification may serve as evidence of financial responsibility in lieu of the certified financial statements and reports.

STATE REGISTRATION OF OUT-OF-STATE CONTRACTORS. Bidders are advised that K.S.A. 79-1008, 79-1009 requires the registration of out-of-state contractors with the Director of Revenue for collection of tax.

NON-RESIDENT BIDDERS. Attention is directed to Section 16-113 and 16-114 of the Kansas Statutes Annotated which requires that any Non-Resident Contractor who undertakes the construction of any public improvement to be paid for out of public funds, must appoint in writing and file with the Kansas Secretary of State, some person (resident in Shawnee County, Kansas) on whom service may be had in any civil action which may arise out of such contractual relation.

ALTERNATE BIDS. Bidder shall complete all blanks provided on the proposal forms. When so permitted by the Owner, the Bidder shall legibly write the statement "No Bid" for those alternate bid options that the Bidder elects not to submit a proposal.

SUBMISSION OF BID PROPOSAL. Proposals shall be sent to arrive at the specified time and date for receipt of bids. Proposals received after the specified time will not receive consideration and will be returned unopened. Proposals shall be enclosed in a sealed opaque envelope. Each proposal shall be addressed to the office location identified in the Notice-to-bidders. The upper left-hand corner of the envelope shall be marked as follows:

CONTRACT PROPOSAL

Bid of {Insert Name of Bidder} FOE Fuel Farm AIP Project No.: 3-20-0113-045 To be opened at: 10:00 AM, February 27, 2023

BID OPENING. All proposals submitted prior to the stated time and date for receipt of bids will be publicly opened and read aloud by the Owner or the Owner's representative. Bidders, their authorized agents, and other interested parties are invited to attend. Proposals submitted after the stated time and date for receipt of bids will be automatically rejected without consideration and will be returned unopened.

EVALUATION OF PROPOSALS. Proposals may be held by the Owner, in his sole discretion, for purposes of review and evaluation by the Owner for a period not to exceed ninety (90) calendar days from the stated date for receipt of bids. The Owner will tabulate all bids and verify proper extension of unit costs. The Bidder shall honor their proposal for the duration of this period of review and evaluation. The bid guaranty will be held by the Owner until this period of review has expired or a contract has been formally executed.

BID INFORMALITIES AND IRREGULARITIES. The Owner reserves the right to waive any informality or irregularity discovered in any proposal, which in the owner's judgment best serves the Owner's interest. In the situation where an extension of a unit price is found to be incorrect, the stated unit price and correct extension will govern. In the event of a discrepancy between the written and numeral values, the written value shall take precedence.

IRREGULAR PROPOSALS. Proposals meeting the following criteria are subject to consideration as being irregular:

- If the proposal is on a form other than that furnished by the Owner or Owner's representative.
- If the form furnished by the Owner or Owner's representative is altered or detached from the original document.
- If there are unauthorized additions, conditional or alternate pay items or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
- If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized pay items, for which the Bidder is not required to furnish a unit price.
- If the proposal contains unit prices that are obviously unbalanced.
- If the proposal is not accompanied by the bid guarantee specified herein.

DISQUALIFICATION OF BID PROPOSALS. The Owner reserves the right to reject any or all bids, as determined to be in the best interest of the Owner.

Causes for rejection of proposals include but are not limited to:

- Submittal of an irregular proposal.
- Submittal of more than one proposal from the same partnership, firm or corporation.
- Failure by Bidder to submit the bid prior to the stated time and date for receipt of bids.
- Failure by Bidder to furnish satisfactory bid guarantee.
- Failure by Bidder to provide all information required of the bid forms.
- Failure by Bidder to comply with the requirements of bid instructions.
- Failure by the Bidder to demonstrate good faith efforts in obtaining participation by certified DBE firms.
- Failure by the Bidder to conform to the Affirmative Action and Notification of DBE requirements shall be deemed non-responsive and will not be accepted.
- Determination by the Owner that Bidder is not qualified to accomplish the project work.
- Determination by the Owner that the Bidder has placed conditions on or qualified their proposal.
- Discovery of any alteration, interlineations or erasure of any project requirement by the Bidder.
- Inclusion of the Bidder on the "Excluded Parties Listing System" as maintained and published by the General Services Administration.
- Evidence of collusion among bidders.

MODIFICATION AND WITHDRAWAL OF BIDS. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

If, within twenty-four hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of his Bid, Owner may, at its sole discretion, allow that bidder to withdraw his Bid and the Bid Security will be returned.

CANCELLATION OF AWARD. At any time prior to execution of a contract agreement, the Owner reserves the right to cancel the award for any reason without liability to the Bidder, with the exception of the return of the bid guaranty, at any time prior to execution of the contract.

NOTICE OF AWARD OF CONTRACT. It is the intent of the Owner, after a period of review and evaluation, to award a contract to the responsible bidder that submits the lowest responsive proposal. The successful bidder will be informed their bid has been accepted through the Owner's issuance of a Notice-of-Award. The Notice-of-Award shall not be construed as a binding agreement. The proper execution of a contract agreement shall serve as the binding agreement.

FEDERAL FUNDING ASSISTANCE. It is the intent of the Owner to seek Federal participation assistance for this project under the Airport Improvement Program (AIP). Award of contract is conditioned upon the FAA concurring in award of contract and the owner securing Federal assistance. The issuance of the Notice-of-award will not be made until the FAA has concurred in award and Federal funding is confirmed.

AWARD OF ALTERNATES. Unless specifically stated, the Owner reserves the right to accept alternates in any order or combination, which in the judgment of the Owner, best serves the Owner's interest.

RETURN OF BID GUARANTY. The bid guaranty of the successful Bidder will be returned upon successful execution of the contract documents as specified herein. Failure by the successful Bidder to execute the contract documents within the specified time shall result in forfeiture of the bid guaranty. The bid guaranty of the second and third lowest responsible bidders will be retained for a period of one hundred twenty (120) days pending the execution of the contract documents by the successful bidder. Except as noted above, the bid guaranty of unsuccessful bidders will be returned at the point their proposal is rejected.

CONTRACT AGREEMENT. The successful Bidder shall execute the contract agreement in accordance with the accepted bid proposal within **thirty (30) days** of the date of the Notice-of-Award. Failure to execute the contract agreement within the specified time frame may result in the bid being awarded to the next low bidder and shall result in the forfeiture of the Bidder's bid guarantee as a liquidated damage.

CONTRACT TIME. The number of days within which or the date by which the Work is to be completed (the Contract Time) is set forth in the Agreement.

LIQUIDATED DAMAGES. Provisions for liquidated damages are set forth in the Agreement.

PERFORMANCE AND PAYMENT BONDS. The successful Bidder shall furnish <u>separate</u> performance and payment bonds each in the amount of 100% of the contract price. The bonds shall be made payable to the Owner as security for faithful performance of the contract and for the payment of all persons, firms or corporations to whom the Bidder may become legally indebted for labor, materials, tools, equipment or services in the performance of the project work. The form of the bond shall be that provided within the project manual. The current power of attorney for the person signing the bond as a representative of the surety shall be attached to the bonds.

The executed bonds shall be delivered to the Owner within fifteen (15) calendar days from the date of contract execution. Bonds should not be executed prior to execution of the contract agreement. The bonds shall be issued by a solvent Surety, which is certified to operate within the State the project work is located, and which is listed in the current issue of the U.S. Treasury Circular 570. If specifically requested by the Owner, the successful Bidder shall obtain and submit information on the surety's financial strength rating.

SALES TAXES. For all projects, payment of Kansas State Sales Tax or Compensating (Use) tax is not necessary and should not be included in unit prices bid for materials to be incorporated in the work. The

Metropolitan Topeka Airport Authority will furnish an exemption certificate (including exemption certificate number) obtained from the Sales and Compensating Tax Division of the Department of Revenue of the State of Kansas to the Contractor, Subcontractor or repairmen making purchases of any tangible personal property to be incorporated in this project. The Contractor, Subcontractor or repairmen must furnish all suppliers with a copy of the properly executed exemption certificate secured for this project. He may reproduce as many copies of the certificate as he may need.

CERTIFICATES OF INSURANCE. The successful Bidder shall furnish to the Owner all required certificates of insurance as specified with the project manual.

DBE AFFIRMATION. If not submitted with the proposal, the successful Bidder shall furnish, prior to execution of the contract agreement, written affirmation from each identified Disadvantaged Business Enterprise (DBE) firm of their intent to participate in the project.

APPROVAL OF THE CONTRACT. Upon receipt of the Contract Agreement, Contract Bonds and Certificate of Insurance as executed by the successful Bidder, the Owner will complete execution of the contract conditioned upon the Owner's judgment that it remains in their best interest to enter into the Agreement.

Delivery of the fully executed Contract Agreement to the successful Bidder shall constitute the Owner's approval to be bound by the successful Bidder's proposal and all terms and conditions of the Contract Agreement.

Upon satisfactory execution of the contract by the successful Bidder and the Owner, all references to "Bidder" in the bid documents become equivalent to the term "Contractor".

STANDARD TECHNICAL SPECIFICATIONS. This project shall be subject to the applicable Advisory Circulars (latest edition) of the Federal Aviation Administration with any addenda thereto, or City of Topeka Civil Specifications except as modified or supplemented by specifications contained in this Project Manual.

END OF INSTRUCTIONS TO BIDDERS

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PROPOSAL FORM

METROPOLITAN TOPEKA AIRPORT AUTHORITY FOE FUEL FARM TOPEKA REGIONAL AIRPORT TOPEKA, KANSAS AIP PROJECT NO. 3-20-0113-045

BIDDERS NAME:

TO: Metropolitan Topeka Airport Authority

6510 SE Forbes Avenue, Suite # 1 Topeka, Kansas 66619

AIP Project No.: 3-20-0113-045

Description: FOE Fuel Farm, Topeka Regional Airport, Topeka, Kansas.

The undersigned Bidder, in compliance with the request for bids for construction of the above mentioned Project, hereby proposes and agrees, if this Bid is accepted, to enter into an agreement with the Owner in the form included in the contract Documents to furnish all labor, permits, material, machinery, tools, supplies and equipment to faithfully perform all work as specified or indicated in the Bid Documents in accordance with the project manual, project drawings and issued Addenda within the specified time of performance for the following prices:

Item No.	Description	Unit	Quantity	Unit Price	Extension
1	Temporary Seeding and Mulching	Acre	0.4		
2	Installation and Removal of Silt Fence	LF	988		
3	Installation and Removal of Inlet Protection	EA	1		
4	Installation and Removal of Ditch Check	LF	80		
4	Mobilization	LS	1		
5	Traffic Control	LS	1		
6	Pavement Removal	SY	2,461		
7	Cold Milling (0" to 4")	SY	4,662		
8	Clearing and Grubbing	LS	1		
9	Unclassified Excavation	CY	544		
10	Contractor Furnished Material	CY	1,544		
11	Embankment	CY	1,779		
12	6" Aggregate Base - Type AB-3	SY	3,283		
13	Bituminous Surface Course	Ton	1,140		
14	10" Non-Reinforced Dowel Jointed Concrete Pavement	SY	2,661		
15	10" Reinforced Concrete Pavement	SY	622		
16	Tack Coat	Gal	236		
17	7' Chain-Link Fence with Barbed Wire, Complete	LF	1,382		
18	Vehicle Gate, Manual Sliding (22' Wide)	Ea	1		

Item No.	Description	Unit	Quantity	Unit Price	Extension
19	Vehicle Gate, Manual Sliding (26' Wide)	Ea	1		
20	Vehicle Gate, Manual Sliding (27' Wide)	Ea	1		
21	Vehicle Gate, Manual Sliding (30' Wide)	Ea	1		
22	Vehicle Gate, Manual Sliding (31' Wide)	Ea	1		
23	Pedestrian Swing Gate 6' Wide	Ea	2		
24	Removal of Existing Fence, Complete	LF	448		
25	Installation and Removal of Temporary Fence	LF	1,108		
26	Removal of Existing Gates	Ea	1		
27	Aggregate Mow Strip	LF	1,382		
28	Anti-Burrow Barrier	LF	997		
29	18" Storm Sewer (RCP), (Class IV)	LF	231		
30	24" Storm Sewer (RCP), (Class IV), W/Pipe Collar	LF	16		
31	18" End Section (RC)	Ea	2		
32	Type II-P Area Inlet	Ea	3		
33	Modify Sanitary Sewer Manhole	Ea	1		
34	Seeding, Fertilizing and Mulching	Acre	0.4		
35	Construct New Fuel Facility Complete	LS	1		
36	Decommission and Demolition of Both Existing Fuel Facilities	LS	1		

TOTAL BASE BID (Numeral Format) \$_____

TOTAL BASE BID (Word Format)

ACKNOWLEDGEMENTS BY BIDDER

- a. By submittal of a proposal, the BIDDER acknowledges and accepts that the quantities established by the OWNER are an approximate estimate of the quantities required to fully complete the Project and that the estimated quantities are principally intended to serve as a basis for evaluation of bids. The BIDDER further acknowledges and accepts that payment under this contract will be made only for actual quantities and that quantities will vary in accordance with the General Provisions subsection entitled "Alteration of Work and Quantities".
- b. The BIDDER acknowledges and accepts that the Bid Documents are comprised of the documents identified within the Instructions to Bidders, including without limitation those dealing with the disposition of Bid guarantee. The BIDDER further acknowledges that each of the individual documents that comprise the Bid Documents are complementary to one another and together establishes the complete terms, conditions and obligations of the successful BIDDER.

- c. As evidence of good faith in submitting this proposal, the undersigned encloses a bid guaranty in the form of a certified check, cashier's check or bid bond in the amount of 5% of the bid price. The BIDDER acknowledges and accepts that refusal or failure to accept award and execute a contract within the terms and conditions established herein will result in forfeiture of the bid guaranty to the owner as a liquidated damage.
- d. The BIDDER acknowledges and accepts the OWNER'S right to reject any or all bids and to waive any minor informality in any Bid or solicitation procedure.
- e. The BIDDER acknowledges and accepts the OWNER'S right to hold all Proposals for purposes of review and evaluation and not issue a notice-of-award for a period not to exceed **ninety (90) days** from the stated date for receipt of bids.
- f. The undersigned agrees that upon written notice of award of contract, he or she will execute the contract within **thirty** (**30**) **days** of the notice-of-award and furthermore, provide executed payment and performance bonds within **fifteen** (**15**) **days** from the date of contract execution. The undersigned accepts that failure to execute the contract and provide the required bonds within the stated timeframe shall result in forfeiture of the bid guaranty to the owner as a liquidated damage.
- g. By submittal of this proposal, the undersigned acknowledges and agrees to commence work within ten (10) calendar days of the date specified in the written "Notice-to-Proceed" as issued by the OWNER. The anticipated date that project work may commence is on or about **April 1, 2023.** The undersigned further agrees to complete the Project within 330 Calendar Days from the Notice-to-Proceed.
- h. The bidder acknowledges and accepts that for each and every Calendar Day the project remains incomplete beyond the contract time of performance, the substantial completion date, or not open to traffic as stipulated in the preceding paragraphs of this section, the CONTRACTOR shall pay the non-penal amount of **\$3,600.00** per calendar day as a liquidated damage to the OWNER.
- i. The BIDDER acknowledges that the OWNER has established a contract Disadvantaged Business Enterprise goal of **nine (9) percent** for this project. The BIDDER acknowledges and accepts the requirement to apply and document good faith efforts, as defined in Appendix A, 49 CFR Part 26, for subcontracting a portion of the prime contract to certified Disadvantaged Business Enterprises (DBE), as defined in 49 CFR Part 26 for purposes of meeting the OWNER'S established goal. The BIDDER, in complying with this requirement, proposes participation by Disadvantaged Business Enterprises as stated on the attached forms, "Utilization Statement" and "Letter of Intent".
- j. The BIDDER, by submission of a proposal, acknowledges that award of this contract is subject to the provisions of the Davis-Bacon Act. The BIDDER accepts the requirement to pay prevailing wages for each classification and type of worker as established in the attached wage rate determination as issued by the United States Department of Labor. The BIDDER further acknowledges and accepts their requirement to incorporate the provision to pay the established prevailing wages in every subcontract agreement entered into by the Bidder under this project.

Compliance Reports (41 CFR Part 60-1.7): Within 30 days after award of this contract, the Contractor/Subcontractor shall file a compliance report (Standard Form 100) if s/he has not submitted a complete compliance report within 12 months preceding the date of award. This report is required if the Contractor/Subcontractor meets all of the following conditions:

- 1. Contractors/Subcontractors are not exempt based on 41 CFR 60-1,5.
- 2. Has 50 or more employees.
- 3. Is a prime contractor or first tier subcontractor.
- 4. There is a contract, subcontract, or purchase order amounting to \$50,000 or more
- k. The undersigned acknowledges receipt of the following addenda:

Addendum Number dated	Received
Addendum Number dated	Received
Addendum Number dated	Received

REPRESENTATIONS BY BIDDER

By submittal of a proposal (bid), the BIDDER represents the following:

- a. The BIDDER has read and thoroughly examined the bid documents including all authorized addenda.
- b. The BIDDER has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests and studies (in addition to or to supplement these referred to in (c) above) which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress, performance or furnishing of the Work as Bidder considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by Bidder for such purposes.
- c. The BIDDER has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports or similar information or data in respect of said Underground Facilities are or will be required by Bidder in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents.
- d. The BIDDER has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- e. The BIDDER has given the Engineer written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Bidder.
- f. The BIDDER has a complete understanding of the terms and conditions required for the satisfactory performance of project work.
- g. The BIDDER has fully informed themselves of the project site, the project site conditions and the surrounding area.
- h. The BIDDER has familiarized themselves of the requirements of working on an operating airport and understands the conditions that may in any manner affect cost, progress, or performance of the work
- i. The BIDDER has correlated their observations with that of the project documents.
- j. The BIDDER has found no errors, conflicts, ambiguities, or omissions in the project documents, except as previously submitted in writing to the owner that would affect cost, progress or performance of the work.
- k. The BIDDER is familiar with all applicable Federal, State, and local laws, rules and regulations pertaining to execution of the contract and the project work that may in any manner affect cost, progress or performance of the work.
- 1. The BIDDER has complied with all requirements of these instructions and the associated project documents.

m. This BID is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other bidder or over Owner.

CERTIFICATIONS BY BIDDER

- a. The undersigned hereby declares and certifies that the only parties interested in this proposal are named herein and that this proposal is made without collusion with any other person, firm or corporation. The undersigned further certifies that no member, officer, or agent of OWNER'S has direct or indirect financial interest in this proposal.
- b. **Certification of Non-Segregated Facilities:** (41 CFR Part 60-1.8) The BIDDER, as a potential federally assisted construction contractor, certifies that it does not maintain or provide, for its employees, any segregated facilities at any of its establishments and that it does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The BIDDER certifies that it will not maintain or provide, for its employees, segregated facilities and that it will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Bidder agrees that a breach of this certification is a violation of the Equal Opportunity Clause, which is to be incorporated in the contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The Bidder agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that it will retain such certifications in its files.

c. Trade Restriction Certification: (49 CFR Part 30)

The Bidder, by submission of an offer certifies that it:

- 1. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR).
- 2. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list.
- 3. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.
- d. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion:** (49 CFR Part 29) The Bidder certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this proposal that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the Bidder or any lower tier

participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

e. **Buy American Certification:** (Title 49 U.S.C. Chapter 501) As a condition of bid responsiveness, the bidder must certify its compliance with the Buy American preferences established under Title 49 U.S.C. Section 50101. Bidders must complete the Buy American certification that is attached to this proposal form.

ATTACHMENTS TO THIS BID

The following documents are attached to and made a part of this Bid:

- 1. Bid Guaranty in the form of _____;
- 2. Completed DBE forms "Utilization Statement" and "Letter of Intent".
- 3. Evidence of good faith efforts required by 49 CFR Part 26, Appendix A. If proposed DBE goal is met, submittal of evidence of good faith efforts is not required.
- 4. Evidence of BIDDER'S qualifications per the requirements of the Instructions-to-Bidders.
- 5. Buy American Certification.

SIGNATURE OF BIDDER

IF AN INDIVIDUAL:		
Name:		
By:	(Signature of Individual)	_
Doing Business as:		_
Business Address:		
Telephone Number:		
IF A PARTNERSHIP:		
Partnership Name:		
By:	(Authorized Signature) (Attach Evidence of Authority to sign as a Part	nership)
Name and Title:		
Business Address:		
Telephone Number:		_
Corporation Name:		
Bv:		
	(Authorized Signature) (Attach Evidence of Authority to sign)	
Name and Title:		_
Business Address:		
Telephone Number:		— (CORPORATE SEAL)
ATTEST:		
By:	(Authorized Signature)	
Name and Title:		_

Joint Venture Name: _	
By:	
_ ,	(Authorized Signature) (Attach Evidence of Authority to sign)
Name and Title:	
Business Address:	
_	
Telephone Number:	
Joint Venture Name:	
By:	
<i>J</i> –	(Authorized Signature)
	(Attach Evidence of Authority to sign)
Name and Title:	
Business Address:	
Telephone Number:	

IF A JOINT VENTURE: (*Attach copy of Joint Venture Agreement*)

Project Number: AIP 3-20-0113-045

Contractor's Name:

List of Subcontractors

The Bidder is required to furnish the following information in accordance with the provisions of paragraph Subcontractors, Etc., in the **Instructions to Bidders** for <u>ALL</u> Subcontractors. Do not list alternate subcontractors for the same work. The Contractor shall list only one subcontractor for each such portion of Work as is defined by the Contractor in his bid. Contractor shall not substitute any person as subcontractor in the place of a subcontractor listed below, except as provided in paragraph Subcontractors, Etc.

The Bidder understands that if he fails to specify a subcontractor for any portion of the Work to be performed under the contract or specifies more than one subcontractor for the same portion of the Work, he shall be deemed to have agreed that he is fully qualified to perform that portion himself and that he shall not be permitted to sublet or subcontract that portion of the Work, except as provided in paragraph Subcontractors, Etc.

Subcontractor:			
Amount:		(\$)
	(words)		
Subcontractor:			
Amount:		(\$)
(words)	(words)		
Subcontractor:			
Amount: (words)		(\$)
	(words)		
Subcontractor:			
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Subcontractor:			
Amount:		(\$)
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Subcontractor:			
Amount:		(\$)
	(words)		-
CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR TOTAL FACILITY

PROJECT NAME:	FOE Fuel Farm
AIRPORT NAME:	Topeka Regional Airport
AIP NUMBER:	3-20-0113-045

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with its proposal. The bidder or offeror must indicate how it intends to comply with 49 USC § 50101 by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e. not both) by inserting a checkmark (\checkmark) or the letter "X".

Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:

- a) Only installing steel and manufactured products produced in the United States; or
- b) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
- c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
- To faithfully comply with providing U.S. domestic products.
- To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
- □ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
 - a) To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that supports the type of waiver being requested.
 - b) That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal.
 - c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
 - d) To furnish U.S. domestic product for any waiver request that the FAA rejects.
 - e) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

Required Documentation

Type 3 Waiver – The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the "facility". The required documentation for a Type 3 waiver is:

- a) Listing of all manufactured products that are not comprised of 100 percent U.S. domestic content (excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location.
- c) Percentage of non-domestic component and subcomponent cost as compared to total "facility" component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

Type 4 Waiver – Total cost of project using U.S. domestic source product exceeds the total project cost using non-domestic product by 25 percent. The required documentation for a Type 4 of waiver is:

- a) Detailed cost information for total project using U.S. domestic product
- b) Detailed cost information for total project using non-domestic product

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date

Signature

Company Name

Title

UTILIZATION STATEMENT Disadvantage Business Enterprise

The undersigned bidder/offeror has satisfied the requirements of the bid specification in the following manner. (Please mark the appropriate box)

- □ The bidder/offeror is committed to a minimum of _____% DBE utilization on this contract.
- □ The bidder/offeror, while unable to meet the DBE contract goal of _____%, hereby commits to a minimum of _____% DBE utilization on this contract and submits the attached documentation as evidence demonstrating good faith efforts (GFE) in seeking participation by certified DBE firms.

The undersigned hereby further assures that the information included herein is true and correct, and that the DBE firm or firms identified within the submitted Letter-of-Intent forms have agreed to perform a commercially useful function for the indicated work elements. The undersigned further understands that no changes to this statement may be made without prior approval from the Owner and the Federal Aviation Administration

Bidder's/Offeror's Firm Name

Signature

Date

	Contract Amount		DBE Amount	Contract
Percentage				
DBE Prime Contractor	\$	x 1.00 =	\$	%
DBE Subcontractor	\$	x 1.00 =	\$	%
DBE Supplier	\$	x 0.60 =	\$	%
DBE Manufacturer	\$	x 1.00 =	\$	%
Total Amount DBE DBE Goal			\$ \$	%

DBE UTILIZATION SUMMARY

Note: If the total proposed DBE participation is less than the established DBE goal, Bidder must provide written documentation of the good faith efforts as required by 49 CFR Part 26.

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LETTER OF INTENT

	Disadvantage Business (<i>This page shall be submitted fo</i>	E nterprise r each DBE firm)	
Bidder/Offer	Name:		
	Address:		
	City:	State:	Zip:
DBE Firm:	DBE Firm <u>:</u>		
	Address:		
	City:	State:	Zip:
DBE Contact Person:	Name:	Phone: ()
DBE Certifying Agency:		Expiration Date	:
	Each DBE Firm shall submit certification status.	evidence (such as a photo	ocopy) of their
Classification:	Prime Contractor	ubcontractor upplier	Joint Venture
Work item(s) to be performed by DBE	Description of Work Item	Quantity	Total
The bidder/offeror is committe estimated participation is as fol	d to utilizing the above-named DB llows:	E firm for the work descr	ibed above. The
DBE contract amount: \$		Percent of total contract:	%
AFFIRMATION: The above-named DBE firm a tated above.	ffirms that it will perform the porti	on of the contract for the	e estimated dollar value a
AFFIRMATION: The above-named DBE firm a stated above. By:	ffirms that it will perform the porti	on of the contract for the	e estimated dollar value a

Note: In the event the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

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Form of **CONTRACT AGREEMENT**

METROPOLITAN TOPEKA AIRPORT AUTHORITY FOE FUEL FARM TOPEKA REGIONAL AIRPORT TOPEKA, KANSAS AIP PROJECT NO. 3-20-0113-045

THIS AGREEMENT, made as of ______, 2023 is

BY AND BETWEEN

The OWNER:

Metropolitan Topeka Airport Authority 6510 SE Forbes Avenue, Suite # 1 Topeka, KS 66619

And the CONTRACTOR:

WITNESSETH:

WHEREAS it is the intent of the Owner to make improvements at Topeka Regional Airport generally described as follows: FOE Fuel Farm, Topeka Regional Airport, Topeka, Kansas, AIP 3-20-0113-045, hereinafter referred to as the "Project".

NOW THEREFORE in consideration of the mutual covenants hereinafter set forth, OWNER and CONTRACTOR agree as follows:

Article 1 - Work

It is hereby mutually agreed that for and in consideration of the payments as provided for herein to the CONTRACTOR by the OWNER, CONTRACTOR shall faithfully furnish all necessary labor, equipment, and material and shall fully perform all necessary work to complete the Project in strict accordance with this Contract Agreement and the Contract Documents.

Article 2 – Contract Documents

CONTRACTOR agrees that the Contract Documents consist of the following: this Agreement, General Provisions, Supplementary Provisions, Specifications, Drawings, all issued addenda, Noticeto-Bidders, Instructions-to-Bidders, Proposal and associated attachments, Performance Bond, Payment Bond, Wage Rate Determination, Insurance certificates, Equal Opportunity and Affirmative Action Plan, documents incorporated by reference, documents incorporated by attachment, and all OWNER authorized change orders issued subsequent to the date of this agreement. All documents comprising the Contract Documents are complementary to one another and together establish the complete terms, conditions and obligations of the CONTRACTOR. All said Contract Documents are incorporated by reference into the Contract Agreement as if fully rewritten herein or attached thereto.

Article 3 – Contract Price

In consideration of the faithful performance and completion of the Work by the CONTRACTOR in accordance with the Contract Documents, OWNER shall pay the CONTRACTOR an amount equal to:

\$_____

(Amount in Written Words)

(\$_____)

(Amount in Numerals)

subject to the following:

- a. Said amount is based on the schedule of prices and estimated quantities stated in CONTRACTOR'S Bid Proposal, which is attached to and made a part of this Agreement;
- b. Said amount is the aggregate sum of the result of the CONTRACTOR'S stated unit prices multiplied by the associated estimated quantities;
- c. CONTRACTOR and OWNER agree that said estimated quantities are not guaranteed and that the determination of actual quantities is to be made by the OWNER'S ENGINEER;
- d. Said amount is subject to modification for additions and deductions as provided for within the Contract General Provisions.

Article 4 – Payment

Upon the completion of the work and its acceptance by the OWNER, all sums due the CONTRACTOR by reason of faithful performance of the work, taking into consideration additions to or deductions from the Contract price by reason of alterations or modifications of the original Contract or by reason of "Extra Work" authorized under this Contract, will be paid to the CONTRACTOR by the OWNER after said completion and acceptance.

The acceptance of final payment by the CONTRACTOR shall be considered as a release in full of all claims against the OWNER, arising out of, or by reason of, the work completed and materials furnished under this Contract.

OWNER shall make progress payments to the CONTRACTOR in accordance with the terms set forth in the General Provisions. Progress payments shall be based on estimates prepared by the ENGINEER for the value of work performed and materials completed in place in accordance with the Contract Drawings and Specifications.

Progress payments are subject to retainage requirements as set forth in the General Provisions.

Article 5 – Contract Time

The CONTRACTOR agrees to commence and to have the project substantially completed within 330 Calendar Days of the Notice-to-Proceed.

It is expressly understood and agreed that the stated Contract Time is reasonable for the completion of the Work, taking all factors into consideration. Furthermore, extensions of the Contract Time may only be permitted by execution of a formal modification to this Contract Agreement in accordance with the General Provisions and as approved by the OWNER.

Article 6 – Liquidated Damages

The undersigned acknowledges and accepts that for each and every Calendar Day the project remains incomplete beyond the contract time of performance, the substantial completion date, or not open to traffic as stipulated in the preceding paragraphs of this section, the CONTRACTOR shall pay the non-penal amount of \$3,600.00 per calendar day as a liquidated damage to the OWNER.

Furthermore, the CONTRACTOR understands and agrees that.

- a. the OWNER has the right to deduct from any moneys due the CONTRACTOR, the amount of said liquidated damages,
- b. the OWNER has the right to recover the amount of said liquidated damages from the CONTRACTOR, SURETY or both.

Article 7 – CONTRACTOR'S Representations

The CONTRACTOR understands and agrees that all representations made by the CONTRACTOR within the Proposal shall apply under this Agreement as if fully rewritten herein.

Article 8 – CONTRACTOR'S Certifications

The CONTRACTOR understands and agrees that all certifications made by the CONTRACTOR within the Proposal shall apply under this Agreement as if fully rewritten herein. The CONTRACTOR further certifies the following;

- a. <u>Certification of Eligibility</u> (29 CFR Part 5.5)
 - i. By Entering into this contract, the CONTRACTOR certifies that neither he or she nor any person or firm who has an interest in the CONTRACTOR'S firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1);
 - ii. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1);
 - iii. The penalty for making false statements is prescribed in the U.S. Criminal Code 18 U.S.C.
- b. <u>Certification of Non-Segregated Facilities</u> (41 CFR Part 60-1.8)

The federally assisted construction CONTRACTOR, certifies that it <u>does not</u> maintain or provide, for its employees, any segregated facilities at any of its establishments and that it does not permit its employees to perform their services at any location, under its control,

where segregated facilities are maintained. The BIDDER certifies that it <u>will not</u> maintain or provide, for its employees, segregated facilities at any of its establishments and that it will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Bidder agrees that a breach of this certification is a violation of the Equal Opportunity Clause, which is to be incorporated in the contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are

segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The Bidder agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that it will retain such certifications in its files.

Article 9 – Miscellaneous

- a. CONTRACTOR understands that it shall be solely responsible for the means, methods, techniques, sequences and procedures of construction in connection with completion of the Work,
- b. CONTRACTOR understands and agrees that it shall not accomplish any work or furnish any materials that are not covered or authorized by the Contract Documents unless authorized in writing by the OWNER or ENGINEER,
- c. The rights of each party under this Agreement shall not be assigned or transferred to any other person, entity, firm or corporation without prior written consent of both parties,
- d. OWNER and CONTRACTOR each bind itself, their partners, successors, assigns and legal representatives to the other party in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

Article 10 – OWNER'S Representative

The OWNER'S Representative, herein referred to as ENGINEER, and is defined as follows:

Sam Stallbaumer, PE, Project Manager WSP USA 300 Wyandotte, Suite 200 Kansas City, Missouri 64105 TEL: 816-72-4244 MOB: 210-867-6532 E-Mail: sam.stallbaumer@wsp.com Said ENGINEER will act as the OWNER'S representative and shall assume all rights and authority assigned to the ENGINEER as stated within the Contract Documents in connection with the completion of the Project Work.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have executed five (5) copies of this Agreement on the day and year first noted herein.

OWNER	CONTRACTOR
Name: <u>Metropontan Topeka Airport Autionty</u>	
Address: 6510 SE Forbes Avenue, Suite 1	Address:
Topeka, Kansas 66619	
By:	By:
Signature: Eric M. Johnson	Signature
President & Director of Airports	
Title of Representative	Title of Representative
ATTEST	ATTEST
By:	By:
Signature: Cheryl Trobough	Signature:
Title: Director of Administration & Finance	Title:

Project Number:	3-20-0113-045
Contractor's Name:	

List of Subcontractors

The Bidder is required to furnish the following information in accordance with the provisions of the Instructions to Bidders for <u>ALL</u> Subcontractors. Do not list alternate subcontractors for the same work. The Contractor shall list only one subcontractor for each such portion of Work as is defined by the Contractor in his bid. Contractor shall not substitute any person as subcontractor in the place of a subcontractor listed below, except as provided in the Instruction to Bidders.

The Bidder understands that if he fails to specify a subcontractor for any portion of the Work to be performed under the contract or specifies more than one subcontractor for the same portion of the Work, he shall be deemed to have agreed that he is fully qualified to perform that portion himself and that he shall not be permitted to sublet or subcontract that portion of the Work, except as provided in the Instruction to Bidders.

Subcontractor:			
Amount:		(\$)
	(words)		
Subcontractor:			
Amount:		(\$)
	(words)		
Subcontractor:			
Amount:		(\$)
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Subcontractor:			
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Subcontractor:			
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Subcontractor:			
Amount:		(\$)
	(words)		

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

Performance Bond

Any singular reference to Contractor, Surety, Owner of other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):	Metropolitan Topeka Airport Authority
	6510 SE Forbes Avenue, Suite 1
	Topeka, KS 66619

CONTRACT

Date: Amount: Description (Name and Location):

AIP 3-20-0113-045 FOE Fuel Farm Topeka Regional Airport

BOND

Date (Not earlier than Contract Date): Amount: Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRIN	NCIPAL	SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature:		Signature:	
Name and Title:		Name and Title:	
		(Attach Power of Attorney)	

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRI	NCIPAL
Company:	(Corp. Seal)

Signature: —— Name and Title: SURETY Company:

Signature: -

Name and Title:

(Corp. Seal)

EJCDC No. 1910-28-A (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

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1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

3.1. The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and

3.2. The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and Surety have received notice as provided in paragraph 3.1; and

3.3. The OWNER has agreed to pay the Balance of the Contract Price to:

3.3.1. The Surety in accordance with the terms of the Contract;

3.3.2. Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

4.1. Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the CONTRACTOR Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;

4.4.1. After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or

4.4.2. Deny liability in whole or in part and notify the OWNER citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses

the payment tendered or the Surety has denied pliability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.

6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs, executors, administrators, or successors.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

12.1. Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.

12.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

12.3. CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. OWNER Default: Failure of the OWNER, which has neither been remedied not waived, to pay the CONTRACTOR as required by the Contractor or to perform and complete or comply with the other terms thereof.

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(FOR INFORMATION ONLY---Name, Address and Telephone)

AGENT or BROKER: OWNER'S REPRESENTATIVE (Engineer or other party):

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045-2023

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Payment Bond

Any singular reference to Contractor, Surety, Owner of other party shall be considered plural where applicable.

CONTRACTOR (Name and Addre	ess):	SURETY (Name and Address of Principal Place of Business):
OWNER (Name and Address):	Metropolitan Topeka Airp 6510 SE Forbes Avenue, Topeka, KS 66619	port Authority Suite 1
CONTRACT Date: Amount: Description (Name and Location)	AIP 3-20-0113-0 FOE Fuel Farm Topeka Regiona	145 I Airport
BOND Date (Not earlier than Contract Da Amount: Modifications to this Bond Form:	ate):	
Surety and Contractor, intending to do each cause this Performance Bo representative.	be legally bound hereby, s nd to be duly executed on i	subject to the terms printed on the reverse side hereof, ts behalf by its authorized officer, agent or

CONTRACTOR AS PRI	NCIPAL	SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature:		Signature:	
Name and Title:		Name and Title:	
		(Attach Power of Attorney)	

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRIM	NCIPAL
Company:	(Corp. Seal)

Signature: —— Name and Title: SURETY Company:

(Corp. Seal)

Signature: —— Name and Title:

EJCDC No. 1910-28-B (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

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1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the OWNER to pay for labor, materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with the CONTRACTOR:

1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the CONTRACTOR furnishing and the

OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond o shall permit a copy to me made.

15. DEFINITIONS.

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied not waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

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(FOR INFORMATION ONLY---Name, Address and Telephone)

AGENT or BROKER: OWNER'S REPRESENTATIVE (Engineer or other party):

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

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SUPPLEMENTARY PROVISIONS

These Supplementary Conditions amend and/or supplement the General Provision of the Contract and other provisions of the Contract Documents as indicated herein. All contract provisions that are not so amended or supplemented remain in full force and effect.

FEDERAL PROVISIONS

The provisions provided in the section "Contract Provision Guidelines for Obligated Sponsors and Airport Improvement Program Projects" (Federal Provisions) as provided for in this project manual are made a part of the project contract documents.

WARRANTY / GUARANTEE

All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

STORMWATER POLLUTION PREVENTION PLAN

Successful bidder shall assume ownership and responsibility of the project's Stormwater Pollution Prevention Plan from the Metropolitan Topeka Airport Authority. Successful bidder shall satisfactorily demonstrate to the MTAA/Engineer that the bidder has transferred the ownership of the SWPPP to himself at the start of the project. Contractor shall be responsible for installation, maintenance, and inspection of the stormwater pollution prevention installations during the course of the project. At the completion of the project, Contractor shall be responsible for the removal and disposal of stormwater pollution prevention devices from the project site.

STATE PROVISIONS - None

LOCAL PROVISIONS None

CONTRACTOR'S LIABILITY INSURANCE

1.1. Contractor shall purchase and maintain such commercial general liability and other insurance as is appropriate for the Project and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance and furnishing of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed or furnished by Contractor, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

1.1.1. Claims under workers' or workmen's compensation, disability benefits and other similar employee benefit acts, as per state and federal statutory requirements.

1.1.2. Employers Liability Insurance covering claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees with a \$500,000.00 each person, limit.

1.1.3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

1.10.4. Claims for property damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;

1.1.5. Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property; and

1.1.6. The commercial general liability insurance required under paragraphs 1.1.3 through 1.1.5 shall have the following specific coverages:

(1) General Liability:

1. Each Occurrence	\$1,000,000
2. Personal and Advertising Injury	\$1,000,000
3. Products and Completed Operations Aggregate	\$1,000,000
4. General Aggregate	\$2,000,000
5. Rented Premises	\$ 100,000
6. Medical Expenses	\$ 5,000

(2) Excess Liability:

Bodily Injury and Property Damage Combined:

\$1,000,000 Each Occurrence

\$1,000,000 Annual Aggregate

The commercial general liability insurance shall include completed operations insurance. Property Damage liability insurance shall be provided with coverages for explosion, collapse and underground hazards, where applicable. The Owner shall be named as an additional insured on the Contractor's general liability policy.

(3) Automobile Liability:

Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle. Coverages for hired car and employee non-owned auto liability shall also be provided. The coverage limits shall be:

Combined Single Limit for Each Occurrence \$1,000,000

(4) Contractual Liability Insurance:

1.2. The commercial general liability insurance required by paragraph 1.1 will include contractual liability insurance applicable to Contractor's obligations under the Contract Documents.

(5) Property Insurance:

1.3. Contractor shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as required by Laws and Regulations) for all projects which include construction of or modification to above ground structures. This insurance shall include the interests of Owner, Contractor and Subcontractors all of whom shall be listed as insured or additional insured parties, shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance, Contractor shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment.

1.4. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by Laws and Regulations which will include the interests of Owner, Contractor and Subcontractors all of whom shall be listed as insured or additional insured parties.

Owners Liability Insurance

1.5. Contractor, at his sole expense, shall purchase Owner's Protective Liability Insurance and provide owner with the original policy. This insurance shall be maintained in full force and effect for the duration of the Contract by Contractor and shall name the Owner as the named Insured. This insurance shall have the following limits:

Each Occurrence \$1,000,000 General Aggregate \$1,000,000

This insurance shall protect Owner against any and all claims and liabilities for injury to or death of persons, or damage to property caused in whole or in part by, or alleged to have been caused in whole or in part by, the negligent acts or omissions of Contractor or Subcontractors or any agent, servant, worker or employee of Contractor or Subcontractor arising from the operations or Work for the project.

Notice of Cancellation

1.6. All of the policies of insurance so required to be purchased and maintained (or the certificates) in accordance with paragraphs 1.1 through 1.5 shall contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty (30) days prior written notice has been given to Owner. All such insurance shall remain in effect until final payment and at all times thereafter when Contractor may be correcting, removing or replacing defective Work in accordance with the Project Manual. In addition, Contractor shall maintain such completed operations insurance for one year after

final payment and furnish Owner with evidence of continuation of such insurance at final payment.

Receipt and Application of Proceeds

1.7. Any insured loss under the policies of insurance required by paragraphs 1.3 and 1.4 will be adjusted with Owner and made payable to Owner as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 1.10, Owner shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order.

1.8. Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as trustee shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, Owner as trustee shall, upon the occurrence of an insured loss, give bond for the proper performance of such duties.

Acceptance of Insurance

1.9. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with paragraphs 1.1 through 1.5 on the basis of its not complying with the Contract Documents, Owner shall notify Contractor in writing thereof within thirty days of the date of delivery of such certificates to Owner. Contractor shall provide to Owner such additional information in respect of insurance provided by Contractor as Owner may reasonably request. Failure by Owner to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by Contractor as complying with the Contract Documents. All Certificates of Insurance shall utilize the ACORD 25-S form, most recent revision date.

Partial Utilization - Property Insurance

1.10. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with the Project Manual; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use or occupancy.

WAGE RATES Reference is made to 29 CFR 1 §1.6 Use and effectiveness of wage determinations, paragraph (c) (3) (iv).

The wage rates for the project are contained in the wage rate determination included in the project manual. The wage rates for the project may change and the current wage rate may be incorporated into the project under two conditions.

Condition 1:

If wage rate is updated 10 days before bid opens, the updated wage rate will be added to the project documents via an addendum and shall be used in the development of the bid.

Condition 2:

Wage rate is updated after bids are opened and the contract was not awarded within 90 days of bid opening, the contract will be amended to incorporate the wage rate as of the contract award date. The Notice to Proceed date will not be considered to be the contract award date.

ATTACHMENTS TO SUPPLEMENTARY CONDITIONS

A. <u>Department of Labor Wage Rate Determination</u> – See Section WR-H - Wage Rates Decision Number KS20230148 Modification Number 0 – 01/06/2023, or Section WR-B Wage Rate decision KS20230058 Modification Number 0 – 01/06/2023.

Information regarding civil construction items will be referred to the COT (City of Topeka) civil specifications or Federal Aviation Administration specifications.

Any references to Architect, Engineer, Construction Inspector, Resident Project Representative will be construed to be "Owner's Representative".

Any references to City of Topeka shall be construed to be Metropolitan Topeka Airport Authority (MTAA) unless the item of concern specifically references technical specifications or requirements of the City of Topeka.

REVISIONS TO COT SPECIFICATIONS

Section 5 - Concrete Pavement and Structures

- 1. Paragraph 5.01 A. (2) Pavement Class-A, Pavement Class-A shall be used for the concrete paving on this project.
- 2. Paragraph 5.03 A. (1) Reinforcing Bars, reinforcing bars shall be Grade 60.
- 3. Paragraph 5.03 A. (4) Dowels, dowels shall be Grade 60. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.
- 4. Paragraph 5.05 B. (5) Joint Sealants, joint sealants shall meet the requirements of FAA Specification P-605 Joint Sealants for Concrete Pavements.

Section 7 - Asphaltic Concrete Surfacing

- 1. Paragraph 7.02 B. (1) second sentence, PG 70-28 Performance Graded Asphalt Binder shall be used on this project.
- 2. Paragraph 7.02 B. (1) third sentence, reclaimed asphalt pavement will not be allowed in the mix.
- 3. Paragraph 7.02 C. second sentence, reclaimed asphalt pavement will not be allowed in the mix.
- 4. Paragraph 7.02 D. Table 7.02D, use the Principal/Minor Arterial and Major/Minor Collector column for design parameters.

END OF SUPPLEMENTARY PROVISIONS

"General Decision Number: KS20230058 01/06/2023

Superseded General Decision Number: KS20220058

State: Kansas

Construction Type: Building

County: Shawnee County in Kansas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	 Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	 Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker

protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number 0	Publication Date 01/06/2023	
BRKS0015-011 06/01/20	20	
	Rates	Fringes
TILE SETTER	\$ 36.79	15.78
BRKS0015-012 04/01/20	20	
	Rates	Fringes
BRICKLAYER	\$ 36.83	19.65
BRKS0015-014 06/01/20	20	
	Rates	Fringes
TILE FINISHER	\$ 17.99	.91
ELEC0226-003 09/01/20	22	
	Rates	Fringes
ELECTRICIAN	\$ 34.75	20.80
ENGI0101-040 04/01/20	16	
	Rates	Fringes
POWER EQUIPMENT OPERAT Bobcat/Skid Steer	OR: /Skid	
Loader Oiler	\$ 37.63 \$ 32.08	15.97 15.97
Paver (Asphalt, A and Concrete)	ggregate, \$ 38.44	15.97
IRON0010-018 04/01/20	22	
	Rates	Fringes
IRONWORKER (Ornamental/Reinforcin	g)\$ 35.50	32.68
LAB01290-013 04/01/20	22	
	Rates	Fringes
LABORER Mason Tender - Br	ick\$ 31.10	18.05
PAIN2012-008 04/20/20	22	

	Rates	Fringes
PAINTER (Brush, Roller, and Spray)	\$ 33.35	18.73
PLUM0441-016 06/01/2022		
	Rates	Fringes
PIPEFITTER (HVAC Pipe Installation Only)	\$ 38.63	19.21
PLUM0441-017 06/01/2022		
	Rates	Fringes
PLUMBER	\$ 38.63	19.21
PLUM0533-012 06/01/2016		
	Rates	Fringes
PIPEFITTER (Excludes HVAC Pipe Installation)	\$ 45.33	19.32
ROOF0020-021 06/01/2022		
	Rates	Fringes
ROOFER	\$ 36.75	20.99
SHEE0002-011 07/01/2022		
	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only)	\$ 48.68	25.58
SHEE0002-012 07/01/2022		
	Rates	Fringes
SHEET METAL WORKER (Excludes HVAC Duct Installation)	\$ 48.68	25.58
TEAM0541-010 04/01/2020		
	Rates	Fringes
TRUCK DRIVER (Lowboy Truck)	\$ 34.29	15.25
TEAM0541-011 04/01/2020		
	Rates	Fringes
TRUCK DRIVER (Semi-Trailer		

Truck).....\$ 34.29 15.25

SUKS2015-027 07/08/2015

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR\$	5 23.95	11.59
CARPENTER\$	22.94	7.04
CEMENT MASON/CONCRETE FINISHER\$	5 21.01	3.31
IRONWORKER, STRUCTURAL\$	29.00	25.35
LABORER: Common or General\$	5 19.31	9.42
LABORER: Mason Tender - Cement/Concrete\$	5 17.86	1.01
OPERATOR: Backhoe/Excavator/Trackhoe\$	6 26.69	7.01
OPERATOR: Bulldozer\$	33.12	13.96
OPERATOR: Crane\$	33.19	14.16
OPERATOR: Forklift\$	34.83	14.16
OPERATOR: Grader/Blade\$	31.05	13.26
OPERATOR: Loader\$	30.35	12.04
OPERATOR: Roller\$	33.78	13.64
TRUCK DRIVER: Dump (All Types)\$	25.50	10.38

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information
on contractor requirements and worker protections under the EO
is available at
https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request
review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISIO"

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"General Decision Number: KS20230148 01/06/2023

Superseded General Decision Number: KS20220148

State: Kansas

Construction Type: Highway

County: Shawnee County in Kansas.

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	 Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	 Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at

http://www.dol.gov/whd/govcontracts.

Modification Number Ø	Publication Date 01/06/2023	
IRON0010-009 04/01/20	22	
	Rates	Fringes
IRONWORKER, STRUCTURAL	\$ 35.50	32.68
UAVG-KS-0006 05/09/20	19	
	Rates	Fringes
LABORER: Pipelayer	\$ 31.44	15.99
SUKS2019-087 05/09/2	019	
	Rates	Fringes
CARPENTER, Includes Fo	rm Work\$ 17.12	4.74
CEMENT MASON/CONCRETE	FINISHER\$ 27.45	10.10
ELECTRICIAN	\$ 29.93	14.14
IRONWORKER, REINFORCIN	G\$ 30.50	27.05
LABORER: Common or Ge	neral\$ 17.30	8.37
LABORER: Concrete Saw Held/Walk Behind)	(Hand \$ 29.21	14.63
LABORER: Flagger	\$ 13.20 **	0.00
LABORER: Mason Tender Cement/Concrete	_ \$ 29.75	12.83
OPERATOR: Backhoe/Excavator/Trac	khoe\$ 26.78	11.94
OPERATOR: Bobcat/Skid Steer/Skid Loader	\$ 21.75	11.31
OPERATOR: Broom/Sweep	er\$ 19.17	0.00
OPERATOR: Bulldozer	\$ 19.35	5.41
OPERATOR: Concrete Fi Machine	nishing \$ 24.26	0.00
OPERATOR: Crane	\$ 21.18	6.96
OPERATOR: Grader/Blad	e\$ 25.14	9.03

OPERATOR: Loader\$ 18.87 4.26
OPERATOR: Material Transfer Vehicle\$ 14.65 ** 0.00
OPERATOR: Mechanic\$ 25.45 9.49
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)\$ 27.84 15.53
OPERATOR: Roller\$ 16.09 ** 0.00
OPERATOR: Scraper\$ 17.67 0.00
OPERATOR: Screed\$ 16.93 0.00
OPERATOR: Tractor\$ 16.96 0.00
OPERATOR: Roto Mill Groundman\$ 18.43 0.00
OPERATOR: Roto Mill\$ 21.05 0.00
OPERATOR: Striping Machine\$ 27.27 12.25
TRAFFIC CONTROL: Service Driver\$ 15.76 ** 0.00
TRAFFIC SIGNALIZATION:
(Groundman)
TRUCK DRIVER: Water Truck\$ 22.45 11.51
TRUCK DRIVER: Dump and Tandem\$ 23.2311.51
TRUCK DRIVER: Flatbed and Lowboy\$ 23.82 9.89
TRUCK DRIVER: Off Road Truck\$ 19.06 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at

https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

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2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISIO"

SUPPLEMENTARY PROVISIONS

PART A - FEDERAL CONTRACT PROVISIONS FOR CONSTRUCTION AND EQUIPMENT CONTRACTS

APPLICATION OF REFERENCES

All references made herein to "Contractor", "Bidder", and "Offeror" shall pertain to the Prime Contractor. All references made herein to "subcontractor" shall pertain to any and all subcontractors under contract with the Prime Contractor or a subcontractor.

ALL REFERENCES MADE HEREIN TO "CONSULTANT" SHALL PERTAIN TO ARCHITECT/ENGINEER (A/E) UNDER CONTRACT WITH THE SPONSOR. ALL REFERENCES MADE HEREIN TO "SUBCONSULTANT" SHALL PERTAIN TO ANY AND ALL SUBCONSULTANTS UNDER CONTRACT WITH THE A/E.

ALL REFERENCES MADE HEREIN TO "SPONSOR" AND "OWNER" SHALL PERTAIN TO THE STATE, CITY, AIRPORT AUTHORITY OR OTHER PUBLIC ENTITY EXECUTING CONTRACTS WITH THE PRIME CONTRACTOR AND/OR THE A/E.

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PROVISIONS APPLICABLE TO ALL CONTRACTS

ACCESS TO RECORDS AND REPORTS

Reference: 2 CFR § 200.333, 2 CFR § 200.336, and FAA Order 5100.38

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives, access to any books, documents, papers, and records of the Contractor, which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

BUY AMERICAN PREFERENCE

Reference: 49 USC § 50101

The Contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration (FAA) has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

A Bidder or Offeror must complete and submit the Buy America certification included herein with their bid or offer. The Owner will reject as nonresponsive any bid or offer that does not include a completed Certificate of Buy American Compliance.

CIVIL RIGHTS – GENERAL

Reference: 49 USC § 47123

The Contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

CIVIL RIGHTS – TITLE VI ASSURANCES

Title VI Solicitation Notice

The Sponsor, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerers that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in

response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

Compliance with Nondiscrimination Requirements

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:

- 1. **Compliance with Regulations:** The Contractor (hereinafter includes Consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
- 2. Non-discrimination: The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
- 3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the Contractor's obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.
- 4. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts And Authorities and instructions. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation as appropriate, and will set forth what efforts it has made to obtain the information.
- 5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the nondiscrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
 - a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or
 - b. Cancelling, terminating, or suspending a contract, in whole or in part.
- 6. **Incorporation of Provisions:** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such

provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR Part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

DISADVANTAGED BUSINESS ENTERPRISE

Reference: 49 CFR Part 26

Solicitation Language (Project Goal)

Information Submitted as a matter of bidder responsiveness:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

As a condition of bid responsiveness, the Bidder or Offeror must submit the following information with their proposal on the forms provided herein:

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal;
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal; evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR Part 26.

Information submitted as a matter of bidder responsibility:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment within five (5) days after bid opening.

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

Race/Gender Neutral

The requirements of 49 CFR Part 26 apply to this contract. It is the policy of the Owner to practice nondiscrimination based on race, color, sex or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

Contract Assurance (§ 26.13)

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of U.S. Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Owner deems appropriate, which may include, but is not limited to:

- 1) Withholding monthly progress payments;
- 2) Assessing sanctions;
- 3) Liquidated damages; and/or
- 4) Disqualifying the Contractor from future bidding as non-responsible.

Prompt Payment (§26.29)

The Prime Contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than thirty (30) calendar days from the receipt of each payment the Prime Contractor receives from the Owner. The Prime Contractor agrees further to return retainage payments to each subcontractor within thirty (30) calendar days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

ENERGY CONSERVATION REQUIREMENTS

Reference: 2 CFR § 200 Appendix II(H)

Contractor and Subcontractor(s) agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201 et seq).

FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

Reference: 29 USC § 201, et seq.

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

Reference: 20 CFR Part 1910

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The employe must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

RIGHT TO INVENTIONS

Reference: 2 CFR § 200 Appendix II(F) and 37 CFR §401

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR Part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within in the 37 CFR §401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental or research work.

SEISMIC SAFETY

Reference: 49 CFR Part 41

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

TAX DELINQUENCY AND FELONY CONVICTIONS

Reference: Sections 415 and 416 of Title IV, Division L of the Consolidated Appropriations Act, 2014 (Pub. L. 113-76) and DOT Order 4200.6

The Contractor certifies:

 It is not a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. 2) It is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months. A felony conviction is a conviction within the preceding twenty four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

The Contractor agrees to incorporate the above certification in all lower tier subcontracts.

TRADE RESTRICTION CERTIFICATION

Reference: 49 USC § 50104 and 49 CFR Part 30

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror:

- is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (U.S.T.R.);
- 2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the U.S.T.R; and
- 3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

- 1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R. or
- 2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such U.S.T.R. list or
- 3) who incorporates in the public works project any product of a foreign country on such U.S.T.R. list;

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge

and information of a Contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by U.S.T.R, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the Federal Aviation Administration.

VETERAN'S PREFERENCE

Reference: 49 USC § 47112(c)

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 U.S.C. 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$2,000

COPELAND "ANTI-KICKBACK' ACT

Reference: 2 CFR § 200 Appendix II(D) and 29 CFR Parts 3 and 5

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 U.S.C. 874 and 40 U.S.C. 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

DAVIS-BACON REQUIREMENTS

Reference: 2 CFR § 200 Appendix II(D) and 29 CFR Part 5

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (A) thru (D)

(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under

the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within thirty (30) days of receipt and so advise the contracting officer or will notify the contracting officer within the thirty (30)-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within thirty (30) days of receipt and so advise the contracting officer or will notify the contracting officer within the thirty (30)-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: *Provided*, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and that show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) thru (D)

(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at https://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The Prime

Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a Prime Contractor to require a subcontractor to provide addresses and social security numbers to the Prime Contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- The payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;
- (2) Each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;
- (3) Each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

- 4. Apprentices and Trainees
 - (i) Apprentices

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first nintey (90) days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the applicable wage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.

Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the

full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$3,500

DISTRACTED DRIVING

Reference: Executive Order 13513 and DOT Order 3902.10

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or sub-grant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$3,500 and involve driving a motor vehicle in performance of work activities associated with the project.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$10,000

AFFIRMATIVE ACTION REQUIREMENT

Reference: 41 CFR Part 60-4 and Executive Order 11246

- 1. The Bidder's or Offeror's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
- 2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables:	Goal:
Goals for minority participation for each trade:	
Goals for female participation in each trade:	6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- 3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within ten (10) working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
- 4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is:

State	County	City

EQUAL EMPLOYMENT OPPORTUNITY (EEO)

Reference: 2 CFR 200, Appendix II(C), 41 CFR § 60-1.4, 41 CFR § 60-4.3, and Executive Order 11246

Equal Opportunity Clause

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identify or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Standard Federal Equal Employment Opportunity Construction Contract Specifications

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);

(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);

(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7.a through 7.p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract or substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training

period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff,

termination, or other employment decisions including specific review of these items with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

I. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female Contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7.a through 7.p). The efforts of a Contractor association, joint Contractor union, Contractor community, or other similar groups of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7.a through 7.p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the

program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally), the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

PROCUREMENT OF RECOVERED MATERIALS

Reference: 2 CFR § 200.322, 40 CFR Part 247, and Solid Waste Disposal Act

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

- a) The contract requires procurement of \$10,000 or more of a designated item during the fiscal year; or,
- b) The Contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at:

https://www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the Contractor can demonstrate the item is:

- a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
- b) Fails to meet reasonable contract performance requirements; or
- c) Is only available at an unreasonable price.

PROHIBITION OF SEGREGATED FACILITIES

Reference: 41 CFR § 60

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

TERMINATION OF CONTRACT

Reference: 2 CFR § 200 Appendix II(B) and FAA Advisory Circular 150/5370-10, Section 80-09

Termination for Convenience (Construction & Equipment Contracts)

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

- 1. Contractor must immediately discontinue work as specified in the written notice.
- 2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
- 3. Discontinue orders for materials and services except as directed by the written notice.
- 4. Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work and as directed in the written notice.
- 5. Complete performance of the work not terminated by the notice.
- 6. Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

- 1) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
- 2) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
- 3) reasonable and substantiated claims, costs and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
- 4) reasonable and substantiated expenses to the Contractor directly attributable to Owner's termination action

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

Termination for Default (Construction)

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights and remedies associated with Owner termination of this contract due to default of the Contractor.

Termination for Default (Equipment)

The Owner may, by written notice of default to the Contractor, terminate all or part of this Contract if the Contractor:

- 1. Fails to commence the Work under the Contract within the time specified in the Notice- to-Proceed;
- 2. Fails to make adequate progress as to endanger performance of this Contract in accordance with its terms;
- 3. Fails to make delivery of the equipment within the time specified in the Contract, including any Owner approved extensions;
- 4. Fails to comply with material provisions of the Contract;
- 5. Submits certifications made under the Contract and as part of their proposal that include false or fraudulent statements; or
- 6. Becomes insolvent or declares bankruptcy;

If one or more of the stated events occur, the Owner will give notice in writing to the Contractor and Surety of its intent to terminate the contract for cause. At the Owner's discretion, the notice may allow the Contractor and Surety an opportunity to cure the breach or default.

If within ten (10) days of the receipt of notice, the Contractor or Surety fails to remedy the breach or default to the satisfaction of the Owner, the Owner has authority to acquire equipment by other procurement action. The Contractor will be liable to the Owner for any excess costs the Owner incurs for acquiring such similar equipment.

Payment for completed equipment delivered to and accepted by the Owner shall be at the Contract price. The Owner may withhold from amounts otherwise due the Contractor for such completed equipment, such sum as the Owner determines to be necessary to protect the Owner against loss because of Contractor default.

Owner will not terminate the Contractor's right to proceed with the Work under this clause if the delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such acceptable causes include: acts of God, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, and severe weather events that substantially exceed normal conditions for the location.

If, after termination of the Contractor's right to proceed, the Owner determines that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the Owner issued the termination for the convenience the Owner.

The rights and remedies of the Owner in this clause are in addition to any other rights and remedies provided by law or under this contract.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$25,000

DEBARMENT AND SUSPENSION

Reference: 2 CFR Part 180 (Subpart C), 2 CFR Part 1200, DOT Order 4200.5

Certification of Bidder/Offerer Regarding Debarment

By submitting a bid/proposal under this solicitation, the Bidder or Offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

Certification of Lower Tier Contractors Regarding Debarment

The successful Bidder, by administering each lower tier subcontract that exceeds \$25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful Bidder will accomplish this by:

- 1. Checking the System for Award Management at website: <u>https://www.sam.gov.</u>
- 2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.
- 3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the Federal Aviation Administration (FAA) later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$100,000

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

Reference: 2 CFR § 200 Appendix II (E)

1. Overtime Requirements.

No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for

liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

Reference: 31 U.S.C. § 1352 – Byrd Anti-Lobbying Amendment, 2 CFR part 200, Appendix II(J), and 49 CFR part 20, Appendix A

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- 1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts
under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

PROVISIONS APPLICABLE TO CONTRACTS EXCEEDING \$150,000

BREACH OF CONTRACT TERMS

Reference: 2 CFR § 200 Appendix II(A)

Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the Contractor must correct the breach. Owner may proceed with termination of the contract if the Contractor fails to correct the breach by deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

CLEAN AIR AND WATER POLLUTION CONTROL

References: 2 CFR § 200 Appendix II(G)

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 U.S.C. § 740-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. § 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

The Contractor agrees to incorporate the above certification in all lower tier subcontracts that exceed \$150,000.

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SECTION GP-10 DEFINITION OF TERMS

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

10-01 AASHTO. The American Association of State Highway and Transportation Officials.

10-02 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.

10-03 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-04 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.

10-05 AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-06 AIR OPERATIONS AREA (AOA). The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-07 APRON. Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.

10-08 ASTM INTERNATIONAL (ASTM). Formerly known as the American Society for Testing and Materials (ASTM).

10-09 AWARD. The Owner's notice to the successful bidder of the acceptance of the submitted bid.

10-10 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-11 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-12 CALENDAR DAY. Every day shown on the calendar.

10-13 CERTIFICATE OF ANALYSIS (COA). The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.

10-14 CERTIFICATE OF COMPLIANCE (COC). The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.

10-15 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for work within the scope of the contract and necessary to complete the project.

10-16 CONTRACT. A written agreement between the Owner and the Contractor that establishes the obligations of the parties including but not limited to performance of work, furnishing of labor, equipment and materials and the basis of payment.

The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, General provisions, certifications and representations, Technical Specifications, Plans, Supplemental Provisions, standards incorporated by reference and issued addenda.

10-17 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-18 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-19 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-20 CONTRACTORS QUALITY CONTROL (QC) FACILITIES. The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).

10-21 CONTRACTOR QUALITY CONTROL PROGRAM (CQCP). Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.

10-22 CONTROL STRIP A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.

10-23 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-24 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-25 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.

10-26 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-27 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.

10-28 FAA. The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.

10-29 FEDERAL SPECIFICATIONS. The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.

10-30 FORCE ACCOUNT. a. Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis.

b. Owner Force Account - Work performed for the project by the Owner's employees.

10-31 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-32 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-33 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-34 MATERIALS. Any substance specified for use in the construction of the contract work.

10-35 MODIFICATION OF STANDARDS (MOS). Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.

10-36 NOTICE TO PROCEED (NTP). A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-37 OWNER. The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is the **Metropolitan Topeka Airport Authority**.

10-38 PASSENGER FACILITY CHARGE (PFC). Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.

10-39 PAVEMENT STRUCTURE. The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.

10-40 PAYMENT BOND. The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-41 PERFORMANCE BOND. The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-42 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'

10-43 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-44 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-45 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Owner.

10-46 QUALITY ASSURANCE (QA). Owner's responsibility to assure that construction work completed complies with specifications for payment.

10-47 QUALITY CONTROL (QC). Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.

10-48 QUALITY ASSURANCE (QA) INSPECTOR. An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-49 QUALITY ASSURANCE (QA) LABORATORY. The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.

10-50 RESIDENT PROJECT REPRESENTATIVE (RPR). The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor, and acting directly or through an authorized representative.

10-51 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-52 RUNWAY SAFETY AREA (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.

10-53 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD). Details how the Contractor will comply with the CSPP.

10-54 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-55 SPONSOR. A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-56 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-57 SUBGRADE. The soil that forms the pavement foundation.

10-58 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.

10-59 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%: (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.

10-60 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-61 TAXILANE. A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.

10-62 TAXIWAY. The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

10-63 TAXIWAY/TAXILANE SAFETY AREA (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.

10-64 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-65 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

10-66 OWNER DEFINED TERMS. None

END OF SECTION 10

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SECTION 20 PROPOSAL REQUIREMENTS AND CONDITIONS

20-01 Advertisement (Notice to Bidders). See Section NTB – Notice to Bidders

20-02 Qualification of bidders. Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Owner at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish the Owner satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the State Highway Division and are on the current "bidder's list" of the state in which the proposed work is located. Evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

20-03 Contents of proposal forms. The Owner's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. The Owner will accept only those Proposals properly executed on physical forms or electronic forms provided by the Owner. Bidder actions that may cause the Owner to deem a proposal irregular are given in paragraph 20-09 Irregular proposals.

Mobilization is limited to ten percent (10%) of the total project cost.

20-04 Issuance of proposal forms. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-05 Interpretation of estimated proposal quantities. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be

increased or decreased as provided in the Section 40, paragraph 40-02, Alteration of Work and Quantities, without in any way invalidating the unit bid prices.

20-06 Examination of plans, specifications, and site. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from their own examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

20-07 Preparation of proposal. The bidder shall submit their proposal on the forms furnished by the Owner. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in were indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals which they propose for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall correctly sign the proposal in ink. If the proposal is made by an individual, their name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state where the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

20-08 Responsive and responsible bidder. A responsive bid conforms to all significant terms and conditions contained in the Owner's invitation for bid. It is the Owner's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

- **d.** If the proposal contains unit prices that are obviously unbalanced.
- e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.
- f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 Bid guarantee. Each separate proposal shall be accompanied by a bid bond, certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such bond, check, or collateral shall be made payable to the Owner.

20-11 Delivery of proposal. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 Withdrawal or revision of proposals. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by fax or by email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 Public opening of proposals. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms*, of this section.

20-15 Discrepancies and Omissions. A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Owner's Engineer of the matter. A bidder that has doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than seven (7) days prior to bid opening.

Any interpretation of the project bid documents by the Owner's Engineer will be by written addendum issued by the Owner. The Owner will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

END OF SECTION 20

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SECTION 30 AWARD AND EXECUTION OF CONTRACT

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in Section 20, paragraph 20-09, Irregular Proposals.

b. If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of Bidders*.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within 90 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Owner elects to proceed with an award of contract, the Owner will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price.

30-03 Cancellation of award. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with paragraph 30-07 *Approval of Contract*.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the paragraph 30-01, *Consideration of Proposals*. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds*.

30-05 Requirements of contract bonds. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 Execution of contract. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds*, of this section, within 15 calendar days from the date mailed or otherwise delivered to the successful bidder.

30-07 Approval of contract. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract*, of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Owner.

END OF SECTION GP-30

SECTION 40 SCOPE OF WORK

40-01 Intent of contract. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 Alteration of work and quantities. The Owner reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Owner's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 Omitted items. The Owner, the Owner's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Owner may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Owner's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.

If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to

establish the level of effort necessary for the extra work, the Owner shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, *Limitation of Operations*. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, *Contractor's Responsibility for Utility Service and Facilities of Others*.

b. With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD).

c. When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (<u>http://mutcd.fhwa.dot.gov/</u>), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-06 Removal of existing structures. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and Use of Materials Found in the Work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-07 Rights in and use of materials found in the work. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades,

or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

a. Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the RPR; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 Final cleanup. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Owner.

END OF SECTION 40

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SECTION 50 CONTROL OF WORK

50-01 Authority of the Resident Project Representative (RPR). The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

50-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the RPR will advise the Owner of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications.

The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Owner or the designated representative in writing requesting their written interpretation and decision.

50-04 List of Special Provisions. None

50-05 Cooperation of Contractor. The Contractor shall be supplied with five hard copies or an electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications. Additional hard copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

50-06 Cooperation between Contractors. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-07 Construction layout and stakes. The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for the project. All lines, grades and measurements from control points necessary for the proper execution and control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): hard copy and electronic text files.

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

50-08 Authority and duties of Quality Assurance (QA) inspectors. QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

50-09 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with Plans and Specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's Responsibility for Work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

50-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during Construction*, the RPR shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be recovered as a liquidated damage against the Contractor.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the RPR who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

50-17 Value Engineering Cost Proposal. The provisions of this paragraph will apply only to contracts awarded to the lowest bidder pursuant to competitive bidding.

On projects with original contract amounts in excess of \$100,000, the Contractor may submit to the RPR, in writing, proposals for modifying the plans, specifications or other requirements of the contract for the sole purpose of reducing the cost of construction. The value engineering cost proposal shall not impair, in any manner, the essential functions or characteristics of the project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, design and safety standards. This provision shall not apply unless the proposal submitted is specifically identified by the Contractor as being presented for consideration as a value engineering proposal.

Not eligible for value engineering cost proposals are changes in the basic design of a pavement type, runway and taxiway lighting, visual aids, hydraulic capacity of drainage facilities, or changes in grade or alignment that reduce the geometric standards of the project.

As a minimum, the following information shall be submitted by the Contractor with each proposal:

a. A description of both existing contract requirements for performing the work and the proposed changes, with a discussion of the comparative advantages and disadvantages of each.

b. An itemization of the contract requirements that must be changed if the proposal is adopted.

c. A detailed estimate of the cost of performing the work under the existing contract and under the proposed changes.

d. A statement of the time by which a change order adopting the proposal must be issued.

e. A statement of the effect adoption of the proposal will have on the time for completion of the contract.

f. The contract items of work affected by the proposed changes, including any quantity variation attributable to them.

The Contractor may withdraw, in whole or in part, any value engineering cost proposal not accepted by the RPR, within the period specified in the proposal. The provisions of this subsection shall not be construed to require the RPR to consider any value engineering cost proposal that may be submitted.

The Contractor shall continue to perform the work in accordance with the requirements of the contract until a change order incorporating the value engineering cost proposal has been issued. If a change order has not been issued by the date upon which the Contractor's value engineering cost proposal specifies that a decision should be made, or such other date as the Contractor may subsequently have requested in writing, such value engineering cost proposal shall be deemed rejected.

The RPR shall be the sole judge of the acceptability of a value engineering cost proposal and of the estimated net savings from the adoption of all or any part of such proposal. In determining the estimated net savings, the RPR may disregard the contract bid prices if, in the RPR's judgment such prices do not represent a fair measure of the value of the work to be performed or deleted.

The Owner may require the Contractor to share in the Owner's costs of investigating a value engineering cost proposal submitted by the Contractor as a condition of considering such proposal. Where such a condition is imposed, the Contractor shall acknowledge acceptance of it in writing. Such acceptance shall constitute full authority for the Owner to deduct the cost of investigating a value engineering cost proposal from amounts payable to the Contractor under the contract.

If the Contractor's value engineering cost proposal is accepted in whole or in part, such acceptance will be by a contract change order that shall specifically state that it is executed pursuant to this paragraph. Such change order shall incorporate the changes in the plans and specifications which are necessary to permit the value engineering cost proposal or such part of it as has been accepted and shall include any conditions upon which the RPR's approval is based. The change order shall also set forth the estimated net savings attributable to the value engineering cost proposal. The net savings shall be determined as the difference in costs between the original contract costs for the involved work items and the costs occurring as a result of the proposed change. The change order shall also establish the net savings agreed upon and shall provide for adjustment in the contract price that will divide the net savings equally between the Contractor and the Owner.

The Contractor's 50% share of the net savings shall constitute full compensation to the Contractor for the value engineering cost proposal and the performance of the work.

Acceptance of the value engineering cost proposal and performance of the work shall not extend the time of completion of the contract unless specifically provided for in the contract change order.

END OF SECTION GP-50

SECTION 60 CONTROL OF MATERIALS

60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program* and *Addendum*, that is in effect on the date of advertisement.

60-02 Samples, tests, and cited specifications. All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Owner in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

The Contractor shall employ a Quality Control (QC) testing organization to perform all Contractor required QC tests in accordance with Item C-100 Contractor Quality Control Program (CQCP).

60-03 Certification of compliance/analysis (COC/COA). The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the RPR.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "or equal," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 Plant inspection. The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.

b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 Engineer/ Resident Project Representative (RPR) field office. An Engineer/RPR field office is not required.

60-06 Storage of materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-07 Unacceptable materials. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

60-08 Owner furnished materials. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Ownerfurnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

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SECTION 70 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-01 Laws to be observed. The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-02 Permits, licenses, and taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-03 Patented devices, materials, and processes. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-04 Restoration of surfaces disturbed by others. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) must be shown on the plans and is indicated as follows:

- Owner (Utility or Other Facility): Not applicable
- Location (See Plan Sheet No.):
- Person to Contact (Name, Title, Address and Phone):

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 Federal Participation. The United States Government has agreed to reimburse the Owner for some portion of the contract costs. The contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 Sanitary, health, and safety provisions. The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

70-07 Public convenience and safety. The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with Section 40, paragraph 40-05, *Maintenance of Traffic*, and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of Operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

70-08 Construction Safety and Phasing Plan (CSPP). The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on sheet(s) C110 thru C114 of the project plans.

70-09 Use of explosives. The use of explosives is not permitted on this project.

70-10 Protection and restoration of property and landscape. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 Responsibility for damage claims. The Contractor shall indemnify and hold harmless the Engineer/RPR and the Owner and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any ecovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld

when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 Third party beneficiary clause. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 Opening sections of the work to traffic. If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work must be specified below and indicated on the approved Construction Safety and Phasing Plan (CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. See Sheet C114 in the plans for suggested construction phasing.

Upon completion of any portion of work listed above, such portion shall be accepted by the Owner in accordance with Section 50, paragraph 50-14, *Partial Acceptance*.

No portion of the work may be opened by the Contractor until directed by the Owner in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor's responsibility for work. Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50, paragraph 50-14, *Partial Acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 Contractor's responsibility for utility service and facilities of others. As provided in paragraph 70-04, *Restoration of Surfaces Disturbed by Others*, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents and the owners are indicated as follows:

Federal Aviation Administration – Forbes FCT Rick Stadler Building 620, P.O. Box 19305 Forbes Field Airport Topeka, Kansas 66619 Office Number: 785-862-9421

AT & T Doug Holthaus 823 SE Quincy Street, Room 1050 Topeka, Kansas 66612 Office Number: 785-276-6146

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of Surfaces Disturbed By Others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the RPR continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

70-15.1 FAA facilities and cable runs. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport Owner a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 Furnishing rights-of-way. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 No waiver of legal rights. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 Environmental protection. The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 Archaeological and historical findings. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra Work*, and Section 90, paragraph 90-05, *Payment for Extra Work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and Extension of Contract Time*.

70-21 Insurance Requirements. See the Supplementary Provisions for insurance requirements.

END OF SECTION 70

SECTION 80 EXECUTION AND PROGRESS

80-01 Subletting of contract. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least 25 percent of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

The Contractor shall provide copies of all subcontracts to the RPR 14 days prior to being utilized on the project. As a minimum, the information shall include the following:

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.

80-02 Notice to proceed (NTP). The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within 10 days of the NTP date. The Contractor shall notify the RPR at least 24 hours in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Owner.

80-03 Execution and progress. Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR's review and acceptance at least 10 days prior to the start of work. The Contractor's progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Owner.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall

show all work items identified in the project proposal for each work area and shall include the project start date and end date.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

80-04 Limitation of operations. The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety Phasing Plan (CSPP) and as listed below, cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows: See CSPP Sheets C0.1 thru C0.3 in the plans for AOA closures, time periods they can be closed, type of communications required and the control authority necessary.

The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the approved CSPP.

80-04.1 Operational safety on airport during construction. All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Owner. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time.

80-05 Character of workers, methods, and equipment. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.
All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

80-06 Temporary suspension of the work. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods the Owner may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for such time necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07 Determination and extension of contract time. The number of calendar days shall be stated in the proposal and contract and shall be known as the Contract Time.

If the contract time requires extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

80-07.1 Contract time based on calendar days. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

80-08 Failure to complete on time. For each calendar day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, *Determination and Extension of Contract Time*) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-09 Default and termination of contract. The Contractor shall be considered in default of their contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons, if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

- e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
- f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or
- **h.** Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Owner consider the Contractor in default of the contract for any reason above, the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the RPR of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

80-10 Termination for national emergencies. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 Work area, storage area and sequence of operations. The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate work in accordance with the approved CSPP and SPCD.

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SECTION 90 MEASUREMENT AND PAYMENT

90-01 Measurement of quantities. All work completed under the contract will be measured by the RPR, or their authorized representatives, using United States Customary Units of Measurement.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Excavation and Embankment Volume In computing volumes of excavation, the average end area method will be used unless otherwise specified.

Measurement and Proportion by Weight The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.

Measurement by Volume Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

Asphalt Material will be measured by the gallon or ton. When measured by volume, such volumes will be measured at 60°F or will be corrected to the volume at 60°F using ASTM D1250 for asphalts. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.

Cement will be measured by the ton or hundredweight.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

Plates and Sheets The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

Miscellaneous Items When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound. The use of spring balances will not be permitted.

In the event inspection reveals the scales have been "overweighing" (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of 0.5%.

In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

Rental Equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 *Payment for Extra Work*.

Pay Quantities When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised

by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No Waiver of Legal Rights*.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of Work and Quantities*, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in Section 40, paragraph 40-03, *Omitted Items*, the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 Payment for extra work. Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra Work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, *Payment for Materials on Hand*. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

a. From the total of the amount determined to be payable on a partial payment, 10% percent of such total amount will be deducted and retained by the Owner for protection of the Owner's interests. Unless otherwise instructed by the Owner, the amount retained by the Owner will be in effect until the final payment is made except as follows:

(1) Contractor may request release of retainage on work that has been partially accepted by the Owner in accordance with Section 50-03. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Owner for partially accepted work.

(2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.

b. The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. Contractor must provide the Owner evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

c. When at least 95% of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and Final Payment*.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.

b. The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

90-08 Payment of withheld funds. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in paragraph 90-06 *Partial Payments*, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final Acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with Section 50, paragraph 50-16, *Claims for Adjustment and Disputes*.

After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor Final Project Documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for Adjustments and Disputes*, or under the provisions of this paragraph, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material,

workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except as noted. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within seven (7) days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 Contractor Final Project Documentation. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with Section 40, paragraph 40-08, *Final Cleanup*.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual(s).

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

SECTION 011100 SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract comprises all material, labor, and permits required. The Topeka Regional Ariport (FOE) is located South of Topeka Kansas and is installing a new aboveground fuel storage and bulk loading/unloading facility. The new system will allow the airport to continue to support the local and regional air traffic that they anticipate in the near future, while providing adequate storage capacity, simplifying operations, and ultimately replacing the outdated existing storage facility. The multi-tank system will be based upon industry proven fuel systems designed and installed across the country as developed by Argus Consulting. The proposed system will include multiple aboveground storage tanks to serve JET-A and AVGAS fuel products.
- B. The Drawings and Specifications do not necessarily indicate or describe all work, or the means and method of construction required for completion of the Project. Provide and install all incidentals reasonably inferable from the Contract Documents that are required for a complete Project.
- C. The work shall be constructed in phases in accordance with the requirements of the contract documents.

1.02 RELATED REQUIREMENTS

A. Division 1 - General Requirements of this Project Manual applies to all Specification Sections and Contract drawings.

1.03 FORM OF CONTRACT

1.04 POINTS OF CONTACT

- A. Project Location: Topeka Regional Airport (FOE), Topeka, Kansas
- B. Owner : Metropolitan Topeka Airport Authority (MTAA)
- C. Engineer: Argus Consulting, Inc. 6363 College Blvd, Suite 600, Overland Park, KS 66211

1.05 CONTRACTOR'S USE OF PREMISES

- A. Refer to Supplementary Provision C Local Provisions regarding airport security.
- B. Use the Project Site as shown on the Contract Drawings for execution of the Work of this Contract except as otherwise required or indicated by the requirements of this Project Manual and by conditions of the Contract.
- C. Coordinate use of premises under direction of Owner and Engineer. Contractor shall be responsible for monitoring the use of premises by Contractor's employees and Subcontractors.
- D. Use access routes for delivery of materials and equipment as indicated in the Drawings or as determined in pre-construction meetings. Do not use access routes other than those indicated.
- E. Assume full responsibility under this Contract for the protection and safekeeping of products and equipment to be stored and/or installed on the Site. Store materials and products only in those areas indicated or allowed for staging.
- F. Move any stored Products, which interfere with operations of the Owner, the Property Owner, adjacent tenants of the airport or separate Contractor(s), or as required by the Owner's designated representative at no additional cost. Do not unnecessarily encumber Project Site with materials and equipment.
- G. Limit safe staging and material storage to the on-airport areas designated by the Owner. Obtain specific permission from the Owner for the use of other areas for storage and staging or obtain off-site property at Contractor's sole cost.
- H. Obtain and pay for the use of additional storage or work areas needed for Contractor operations, at no additional cost to the Owner.

- I. Protect sidewalks, pavements, curbs and utilities subject to damage by work under this Contract. Repair or replace any existing work damaged by the Contractor's personnel and/or equipment.
- J. Obtain necessary permits for operation of on-site cranes and other potential obstructions.

1.06 WORK ON EASEMENTS, RIGHT-OF-WAY (R.O.W.), AND ADJACENT PROPERTY

- A. Obtain permission from the property owner[s] and obtain and pay all fees required by applicable governing authorities prior to commencing work on easements, right-of-ways, and adjacent property.
- B. Post all notices and warning signs required by applicable governing authorities.
- C. Perform work on easements, right-of-ways, and adjacent property in accordance with local codes and ordinances and utility company requirements.
- D. Isolate all work of this contract from existing nearby tenants, adjacent property and/or rights-ofway, by use of temporary walls and/or barricades or other means as necessary to maintain access and otherwise limit impacts to their operations.
- E. Restrictions on access to adjacent property are as follows:
 - 1. Access to the site is shown on the Contract Documents. Special access from the airfield may be obtained and coordinated through Airfield Operations.
 - 2. The facility is immediately adjacent to an apron. Contractor shall be aware of active flight operations in the immediate vicinity of the site.

1.07 WORK SEQUENCE

- A. Execute work in an orderly manner coordinated with the work of separate contracts at the Work Site and to all other facilities and operations at the Airport impacted by the Work.
- B. Minimum disruption of Airport operation and use of adjacent facilities and access to those facilities is required. Cooperation with the Owner and the Airport to minimize inconvenience is required.
- C. Construct Work in stages, as specified and as required to minimize inconvenience to the public, to other contractors, the operator, other tenants and the Owner.
- D. The Owner and/or Engineer may require certain work to be performed after normal working hours, on holidays or on weekends. Such work does not constitute a change of scope or additional cost.
- E. The Contractor of this Project should assume that the Contractors of other Projects for the overall facility will be on Site during a portion of, or all of, this Contract duration. The Contractor of this Project will be required to schedule his construction activities, mobilization, and material deliveries with the advance understanding that other contractors will be active throughout the Project.

1.08 COMPLETION

A. The Project shall be completed no later than as indicated on the Project Schedule and as stipulated by the provisions of Division 0.

1.09 OWNER'S SURVEY:

- A. The Contractor shall verify all survey data indicated on the drawings and report any errors and inconsistencies in writing to the Engineer before work is performed in the areas where errors and inconsistencies exist.
- B. Refer to Section 50 Control of Work, for other requirements.

1.10 STAGING AREAS, ACCESS ROADS AND PARKING AREAS

A. Additional access roads to the Project Site and parking areas shall be furnished and maintained by the Contractor during all weather conditions as required by the Project. Prior approval by the Owner and the Airport, of proposed road(s), parking areas, and staging areas to be constructed by the Contractor is required. It may be that additional staging and access areas will not be granted by the Owner or Airport, in which case Contractor must complete the Work in the areas and along the routes shown

B. See the Contract Drawings regarding staging areas.

1.11 PARTIAL OWNER OCCUPANCY

- A. Contractor agrees to the use and occupancy of portions of the Project by the Owner prior to Substantial Completion of the entire Project or portions thereof. The project shall be completed in phases to allow the Operator to use the existing facility to maintain fuel service to the aircraft and GSE.
- B. Contractor provides:
 - 1. Access for Owner personnel.
- C. The Owner's right to perform work with "others" shall not constitute occupancy, partial occupancy or substantial completion.

1.12 SUBCONTRACTORS

A. Subcontractors and suppliers shall be governed by the same requirements as those for the Contractor in the Construction Agreement.

1.13 SAFETY AND SECURITY

- A. Safety and security of the work area of the Contractor is the sole responsibility of the Contractor. The Contractor will comply with Airport guidelines, FAA criteria and all other applicable safety requirements. Any Safety concerns given to the Contractor by the Owner, the Airport, and FAA will be addressed and corrected immediately by the Contractor.
- B. The Owner can, at its option, correct the safety concerns noted to the Contractor. The costs of the corrections will be deducted from the contract amount. The Owner can withhold the Contractor's monthly application for payment should outstanding safety concerns go uncorrected by the Contractor.

1.14 CLEANUP

A. The Site, work area and entrance roads to the Site shall be maintained clean and free of debris by the Contractor at all times. The Owner reserves the right to perform cleaning and deduct the cost from the Contractor's contract amount.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 012500 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 013300 - Compliance Submittals

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:

- d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Engineer, in order to stay on approved project schedule.
- B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Engineer, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Engineer for any required redesign, time spent processing and evaluating the request.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.03 RESOLUTION

- A. Engineer may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Engineer will notify Contractor in writing of decision to accept or reject request.

3.04 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Engineer Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 017800 Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

SECTION 012620 REQUESTS FOR INTERPRETATION (RFI)

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes procedures required when requesting information or clarifications to the Contract Documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROCEDURE

- A. Immediately upon discovery of a need for interpretation of the Contract Documents, and if not possible to request interpretation from the Resident Project Representative, the Contractor shall prepare and submit an RFI in the form specified by the engineer.prior to construction.
 - 1. Coordinate and submit RFI's in a prompt manner so as to avoid delays in the Work.
- B. Content of the RFI: Include a description of item needing interpretation in sufficient detail to include the following:
 - 1. Project name
 - 2. Date
 - 3. Name of Contractor
 - 4. Name of Engineer
 - 5. Sequential RFI number
 - 6. Pertinent reference to applicable specification section number and title. Identify related paragraphs, as appropriate.
 - 7. Drawing number and detail references.
 - 8. Field dimensions and conditions.
 - 9. Provide the Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in RFI.
 - 10. Contractor's signature
 - 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
- C. Engineer's Action: Engineer will review each RFI, determine action required, and return it. Contractor shall allow five working days for the Engineer's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following day.
 - 1. The following RFI's will be returned without action:
 - a. Requests for approval of substitutions.
 - b. Requests for coordination information already indicated in the Contract Documents.
 - c. Incomplete RFI's or RFI's with numerous errors.
 - 2. Engineer's actions may include a request for additional information, in which case Engineer's time for response will start again.
 - 3. Engineer's action on RFI's that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the provisions of the Contract Documents
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contact Sum, notify Engineer in writing within ten days of receipt of the RFI response.
- D. On receipt of the Engineer's response, Contractor shall update the RFI log and immediately distribute the RFI response to affected parties.
- E. Review response and notify Engineer within 5 days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by the RFI number. Submit log weekly. Use CSI format for the log.

END OF SECTION

012620 - Requests for Interpretation (RFI)

SECTION 013300 COMPLIANCE SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section defines procedures for submittal of shop drawings, product data, and samples.
- B. Argus Consulting, Inc. utilizes the Autodesk Construction Cloud (ACC) Build platform for management of construction documents. The software facilitates the control, review, and distribution of these documents. Submittals and Requests for Information (RFIs) are logged and tracked within the software. Contractors are responsible for acquiring a license(s) to the software at their cost for use during construction. Licenses can be purchased through the Autodesk website. Contractor shall submit a projected list of submittals at the Preconstruction Meeting for approval prior to Argus loading into the platform. Argus shall be the administrator of the platform and create/manage the project site and assign access. Contractor shall submit a list of individuals (with email addresses) who need access to the project site.

1.02 REQUIREMENTS INCLUDED

- A. All materials submitted shall adhere to the Buy American Act requirements. All compliance submittals will be reviewed for Buy American Act compliance.
- B. Submit Shop Drawings, Product Data, Samples, Coordination Drawings, Certifications, and Field Mock-Ups concurrently as required by Contract Documents and as reasonably requested by the the Owner and the Design Professional.
- C. Prepare and submit to the Design Professional a list of submittals required by each Specification Section. Submit in accordance with this Section.
- D. Designate in the schedule, the dates for submission and the dates that reviewed shop drawings, product data and samples will be needed in return.

1.03 RELATED REQUIREMENTS

A. Division 1 Sections of the Project Manual are applicable in the execution of all Specification Sections.

1.04 SHOP DRAWINGS

- A. Present drawings in a clear and thorough manner. Prepare original, Project specific documents - do not reproduce Construction Documents and resubmit as shop drawings.
- B. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
- C. Consecutively number shop drawings for each section of work. Retain numbering system throughout all revisions. For example, the first submittal for all work in Section 33 52 43.13 shall be Submittal No. 33 52 43.13-1.
- D. Show detail, materials, dimensions, thickness, methods of assembly, attachments, relationship to adjoining Work and other pertinent data and information.
- E. Verify dimensions and field conditions. Clearly indicate field dimensions and field conditions.
- F. Check and coordinate shop drawings of any section or trade with requirements of other sections or trades as related and as required for proper and complete installation of work.
- G. Prepare composite shop drawings and installation layouts when necessary or requested to depict proposed solutions for tight field conditions. Coordinate in the field and with affected subcontractors for the proper relationship to work of other trades based on field conditions.

1.05 PRODUCT DATA

- A. Preparation
 - 1. Clearly mark each copy to identify pertinent products or models.
 - 2. Show performance characteristics and capacities.
 - 3. Show dimensions and clearances required.
 - 4. Show wiring or piping diagrams and controls.

- 5. Indicate specified finish.
- 6. Indicate applicable specification section.
- B. Manufacturer's standard schematic drawings and diagrams:
 - 1. Modify drawings and diagrams to delete information that is not applicable to the Work.
 - 2. Supplement standard information to provide information specifically applicable to the Work.

1.06 SAMPLES

A. Provide samples as specified.

1.07 COORDINATION DRAWINGS

- A. Prepare coordination drawings (elevations, and details, etc.) to indicate how work shown by separate civil, structural, mechanical and electrical shop drawings are to be interfaced, coordinated and sequenced for installation. Coordination drawings are also required to show all required installation, access and maintenance clearances.
- B. Contractor shall be responsible for coordination of Work.
- C. Hold coordination meeting with all trades attending to coordinate the Work of the trades for each floor and mechanical or electrical area.
- D. It is recommended the Contractor prepare coordination drawings as follows:
 - 1. Structural: Prepare original drawings indicating structural work. Identify waterproofing where required.
 - 2. Civil: Indicate all civil work, including utility locations, within Project limit lines on same original drawings.
 - 3. Fueling: Indicate all fueling equipment and piping on same original drawings. These drawings are not to be considered as piping shop drawings. These drawings should show all valves, fittings, supports, instruments and other items requiring access for service and maintenance. Show all required installation, access and maintenance clearances.
 - 4. The record copies of final composite drawings should be retained by the Contractor and each Subcontractor as a working reference. All shop drawings, prior to their submittal for approval should be compared by the Contractor with the composite drawings and developed accordingly by the trade responsible. Any revisions to the composite drawings that may become necessary during the progress of the work should be noted by all trades and shall be neatly and accurately recorded on the record copies.
- E. Coordination drawings are for the Contractor's use during construction and shall not be construed as replacing any shop drawing or other Project Record Document required by Contract Documents.
- F. The drawings shall be submitted. The coordination drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected. When final information is received data should be promptly inserted on the composite.
- G. No extra compensation will be paid for relocating any pipe, conduit, or other material that has been installed without proper coordination between all the trades involved.
- H. Changes in the scope of the work due to revisions formally issued and approved should be shown on the composite drawings.
- I. The Owner and Design Professional's review of coordination drawings shall not relieve Contractor from overall responsibility for coordination of work performed pursuant to Contract or from other requirements of Contract.

1.08 MANUFACTURER'S CERTIFICATION OF MATERIALS AND EQUIPMENT

- A. Before shop drawings or manufacturer's data for equipment are submitted for approval, a duly authorized manufacturer's representative of the proposed equipment shall review the design of the system relative to the proper operation of his equipment and material.
 - 1. Shop drawings and/or manufacturer's data submitted shall include letter from manufacturer's representative certifying that his equipment and materials will operate and function satisfactorily under the design conditions. If required by the jurisdiction having

B. Before the work is accepted, a duly authorized manufacturer's representative of the installed equipment shall inspect the installation and operation of his equipment and materials to determine that they are properly installed and properly operating in accordance with the manufacturer's recommendations.

1.09 CONTRACTOR REVIEW

- A. Review submittals prior to transmittal. The Contractor shall consecutively number all shop drawings and product data transmittals. Resubmittals shall have the number of the previous submittal followed by the suffix "R1, R2, R3, etc." for the revision number of the submittal. The transmittal is to contain the project number and the applicable specification section for each product represented on the transmittal.
- B. Apply Contractor's stamp to submittals, initialed or signed by authorized person and dated, certifying: review of submittal, verification of products, field measurements and field construction criteria, verification of all dimensions, and coordination of information within submittal with requirements of Work and Contract Documents.
- C. Submittals without Contractor's stamp or submittals that, in Design Professional's opinion are incomplete, contain numerous errors, or have not been checked or have only been checked superficially, will be returned without comments. Delays resulting therefrom shall be Contractor's responsibility.
- D. Clearly note proposed deviations from Contract Documents on submittals. Submit listing identifying deviations in a format acceptable to the Design Professional.
- E. Ensure quantities and dimensions shown on submittals comply with the requirements of the Contract Documents.

1.10 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor. Only the Contractor shall make submittals to the Design Professional.
- B. Submit shop drawings, product data and samples for structural, mechanical and electrical items directly to the consulting engineer with a copy of the transmittal letter to the Design Professional. Upon completion of review, the consulting engineer will send shop drawings, product data and samples to Design Professional.
- C. Submittals are required for all material specified in each Section. If material or equipment is shown on the drawings to be included in this project but is not specified or differs from the material specified, the Contractor shall bring this to the immediate attention of the Design Professional. Submittals are required for all material and equipment incorporated into this project whether specified or not.
- D. The Contractor's attention is called to the Design Professional's review of Compliance Submittals. This review shall be completed and the submittal returned to the Contractor before starting installation or fabrication.
- E. The Contractor's submission of a compliance submittal constitutes that he has verified and coordinated all dimensional data, quantities, field conditions, catalog data, and compliance with the specification or he assumes full responsibility for doing so. The Design Professional's approval of the compliance submittal does not relieve the Contractor of this responsibility.
- F. Number of submittals required:
 - 1. Shop Drawings: Submit electronic copies for civil, structural, mechanical, and electrical..
 - 2. Product Data: Submit electronic copies.
- G. Submittals shall contain:
 - 1. Date of submission and dates of any previous submissions.
 - 2. Project title and number.
 - 3. Contract identification.

- 4. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
- 5. Identification of the product, with the specification section number.
- 6. Field dimensions, clearly identified as such.
- 7. Relation to adjacent or critical features of the Work or materials.
- 8. Applicable standards, such as ASTM or Federal Specification numbers.
- 9. Identification of deviations from Contract Documents.
- 10. Identification of revisions on resubmittals.
- 11. Additional information as required by Contract Documents.
- 12. An 8 in. x 3 in. blank space for Contractor and Design Professional stamps.
- H. The Contractor's responsibility for any deviations in submittals from the requirements of the Contract Documents is not relieved by the Design Professional's review of submittals.
- I. Numbering system established by the Contractor shall be agreeable to the Design Professional and the Owner.

1.11 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Design Professional, revise the number of the submission with the appropriate A, B etc., suffix and resubmit as required until approved.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes that have been made other than those requested by the Design Professional.
 - 3. Revise the number of the submission and resubmit until accepted.
- C. Samples: Submit new samples as required for initial submittal. Remove samples which are "rejected" or designated "resubmit."

1.12 DESIGN PROFESSIONAL REVIEW RESPONSIBILITIES

- A. The Design Professional shall review submittals with responsible promptness.
- B. Affix stamp and initials or signature, and indicate requirements for revisions and resubmittal, if any.
- C. Return submittals to Contractor for distribution, or for resubmission within ten (10) working days of original receipt.
- D. Submittal Review Action:
 - A Approved: Indicates information is sufficient in detail and adequately organized for performance of the review. Material conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as submitted.
 - 2. B Approved as Noted/No Resubmittal Required: Indicates information submitted is sufficient in detail and adequately organized for performance of the review. Material conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as noted. Submitted item is not considered by the reviewer to be a critical element of the project and/or noted comments are minimal in quantity and complexity so that no additional review is necessary. Copies with limited marks are acceptable to all parties as permanent record documents.
 - 3. C Approved as Noted/Resubmit: Indicates information submitted is sufficient in detail and adequately organized for performance of the review. Item generally conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as noted. Submitted item is not considered by the reviewer to be a critical element of the project but noted comments are sufficient in quantity or complexity so that resubmission is appropriate to assure

responsive action, or copies with marks are not acceptable to all parties as permanent record documents. Item must be resubmitted responsive to the reviewers' comments.

- 4. D Revise/Resubmit: Indicates information submitted may not be sufficient in detail or adequately organized for performance of the review. Item may appear to conform to the intended functional requirements of the contract documents but certain elements do not or lack sufficient information to be evaluated. Item is not approved for fabrication, procurement or incorporation into the project. Submitted item is considered by the reviewer to be a critical element of the project and/or noted comments are sufficient in quantity or complexity so that resubmission is necessary to assure acceptable responsive action and conformance with the contract documents. Item must be resubmitted responsive to the reviewers' comments.
- 5. E Rejected/Resubmit: Indicates information submitted is not sufficient in detail, is not adequately organized for performance of the review, or does not conform to the intended functional requirements of the contract documents. Item is not approved for fabrication, procurement or incorporation into the project. Item must be resubmitted responsive to the contract documents and reviewers comments.
- 6. F No Action Required: Indicates item has been submitted for informational purposes only and no action response or comments are needed by the reviewer. Item should be retained in project files.
- G Not Subject to Review: Indicates submission of item was not required by the contract documents and is not part of the reviewers contractual project scope. Item is being returned without review or comment.

PART 2 - PRODUCTS

NOT USED. PART 3 - EXECUTION NOT USED.

SECTION 017800 CLOSE-OUT SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the procedures for close-out of the Work of this Contract.

1.02 WORK INCLUDED:

- A. Closeout Procedures
- B. Warranties
- C. Record Drawings
- D. Manuals
- E. Spare Parts and Maintenance Materials
- F. Final Cleaning
- G. Adjusting

1.03 CLOSEOUT PROCEDURES

- A. Substantial Completion
 - 1. When Contractor considers the Work substantially complete, the Contractor shall submit to the Engineer a written notice listing items to be completed or corrected.
 - 2. Should the Engineer's inspection find the Work not substantially complete, he will promptly notify Contractor in writing, listing observed deficiencies.
 - 3. Contractor shall remedy deficiencies and send a second written notice of substantial completion.
 - 4. When Engineer finds Work substantially complete he will prepare a Certificate of Substantial Completion in accordance with provisions of General Conditions.
- B. Final Completion
 - 1. When Contractor considers Work is complete, he shall submit a written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been inspected for compliance with Contract Documents.
 - c. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - d. Equipment and systems have been tested, flushed, adjusted, and balanced, and are fully operational.
 - e. Work is complete and ready for final inspection and flushing procedures can be implemented.
 - 2. Should Engineer find the Work incomplete, he will promptly notify Contractor in writing listing observed deficiencies.
 - 3. Contractor shall remedy deficiencies and send a second certification of final inspection.
 - 4. When Engineer finds Work is complete, he will consider closeout submittals.
- C. Re-inspection Fees: Should status of completion of Work require reinspection by Engineer due to failure of Work to comply with Contractor's claim on initial inspection, Owner will deduct the amount of Engineer compensation for reinspection services from final payment to Contractor.
- D. Closeout Submittals:
 - 1. Evidence of compliance with requirement of governing authorities:
 - a. Certificates of Inspection required for mechanical and electrical systems.
 - b. Other certificates as required by local authorities.
 - 2. Project Record Drawings One full-size mark-up of As-built information, One full-size set of shop drawings and such format of electronic media acceptable to Engineer and Owner to include PDF files of as-built information, all final shop drawings and all field sketches.
 - 3. Operation and Maintenance Manuals for the equipment and system(s)
 - 4. Warranties and Bonds

- 5. Spare Parts and Maintenance Materials
- 6. Evidence of Payment and Release of Liens: In accordance with the General and Supplementary Conditions of the Contract
- 7. Consent of Surety to Final Payment
- 8. Certificates of Insurance for Products and Completed Operations: In accordance with the General and Supplementary Conditions.
- E. Submit final statement reflecting adjustments to Contract Sum indicating:
 - 1. Original Contract Sum
 - 2. Previous Change Orders
 - 3. Changes under allowances
 - 4. Changes under unit prices
 - 5. Deductions for uncorrected work
 - 6. Deductions for liquidated damages
 - 7. Deductions for reinspection fees
 - 8. Other adjustments to Contract Sum
 - 9. Total Contract Sum as adjusted
 - 10. Previous payments
 - 11. Sum remaining due
- F. Owner will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by change orders.
- G. Submit application for final payment in accordance with provisions of General and Supplementary Conditions of the Contract.

PART 2 - MATERIALS

2.01 WARRANTIES

A. Where guarantees or warranties are required, submit one copy to Engineer prior to final payment. Warranty shall be identified with Project Name and Number on Contract Documents, name and address of Contractor or Subcontractor furnishing warranty, material or installation requiring warranty and date of submittal completion warranty goes into effect.

2.02 RECORD DRAWINGS

- A. At completion of Work and prior to final payment, Contractor shall provide Engineer with a complete set of reproducible drawings showing all changes or variations from Contract Drawings, and not specified on change order drawings theretofore issued. Contractor providing buried cable or similar items shall locate all such items by dimensions and elevations.
- B. Contractor shall be responsible for accuracy and condition of record drawings. Drawings shall show completed layout of cable routing, ducts, equipment, etc., as actually installed.
- C. To comply with above, Contractor shall mark changes on Drawings at the project site as they occur. Job site record drawings may be kept on prints. During first week of each month, Contractor shall present, at the project site, job copy showing variations and changes to Engineer and Owner's Representative for their review.
- D. Provide electronic files of all shop drawings developed by the Contractor.

2.03 MANUALS

- A. Prior to final payment, Contractor, as it applies to his work, shall submit one rough draft of maintenance and operation (M&O) manual presenting full details of care and maintenance and operation of equipment. Once edited, the Contractor shall re-submit the final M&O document in 4 hard copies and 1 electronic copy.
- B. Manual shall be hard cover, approximately 8-1/2" x 11" in size, 3-D-ring binder with index and tabs indicating separations between equipment.
 - 1. Manual shall have name and number of project, nature of manual, name and address of Contractor, and data of manual submittal on cover or in front of manual. Include index and emergency data regarding the installation in front of manual. Above information shall be typewritten.

- 2. Complete instructions regarding maintenance, and a written operating procedure, of all equipment involved.
- 3. Nomenclature of all replaceable parts, part numbers, current cost, and name and address of nearest vendor of parts. Where manuals include manufacturer's catalog pages, clearly indicate items included and delete items not included in this installation.
- 4. Copy of guaranties and warranties
- 5. Copy of approved shop drawings and data concerning changes made during construction.
- 6. Copy of all material contained within, in PDF format on a Flash drive.

2.04 SPARE PARTS AND MAINTENANCE MANUALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that required for completion of the Work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

PART 3 - EXECUTION

3.01 CLEANING PRIOR TO FINAL ACCEPTANCE

- A. Contractor shall execute cleaning of Work prior to inspection for Substantial Completion and Final Cleaning.
- B. Use materials which will not create hazards to health or property, and which will not damage surfaces. Materials and methods used for cleaning shall be a recommended by manufacturer of material being cleaned.
- C. Cleaning shall not be limited to the following:
 - 1. In addition to removal of debris and cleaning specified in other sections, clean interior and exterior exposed-to-view surfaces.
 - 2. Clean equipment and finishes to a sanitary condition. Remove excess lubrication.
 - 3. Clean finishes free of stains, films and other foreign substances
 - 4. Remove, waste, foreign matter, and debris from drainage systems.
 - 5. Clean site; remove foreign substances.
 - 6. Remove waste and surplus materials, rubbish, and construction facilities from the site.
 - 7. Remove temporary protection and labels not required to remain.
 - 8. Maintain cleaning until final completion.
- D. If Contractor does not remove rubbish as specified above, Owner reserves right to have work done by others at Contractor's expense.

3.02 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

SECTION 020000.00 SITEWORK GENERAL PROVISIONS FOR FUELING

PART 1 - GENERAL

1.01 SUMMARY

A. Sitework includes the furnishing of all labor, material, equipment, tools, supervision, and incidentals for the installation of site improvements as shown on the Contract Drawings and described within the specifications.

1.02 RELATED SECTIONS

- A. The General Provisions described herein, together with conditions of the Contract, the general requirements and General Conditions of Division 1, and any Supplementary Conditions in Division 1 apply to work in Division 2.
- B. Section 335243.00 Fuel System General Provisions

1.03 REFERENCES

- A. The following listed documents are incorporated into the Contract Documents and shall control the work to the extent described in the individual specification sections. Referenced published standard specifications govern only to the extent of describing a specific item of work, product, material or quality measurement. In the published referenced documents listed in this Article, any references to methods of measurement and basis of payment are not applicable.
- B. Standard Specifications published by the following organizations:
 - 1. ANSI American National Standards Institute
 - 2. ASTM American Society of Testing Materials
 - 3. AASHTO American Association of State Highway and Transporation Officials
 - 4. ACI American Concrete Institute
- C. Other standards as referenced in the individual technical sections.

1.04 SYSTEM DESCRIPTION

- A. JOB CONDITIONS
 - 1. The Contractor shall inspect in detail the site of the proposed work and familiarize himself with all conditions affecting the execution of the work. The Contractor is responsible for evaluating, assessing, accounting for and including the cost impacts of all existing conditions as they relate to construction performed under this project. No claim for additional compensation or time extensions will be considered for errors resulting from failure or neglect in complying with this requirement.
 - 2. The Contractor can make additional geotechnical investigations at his cost and risk. Prior to making investigations, the Contractor shall obtain permission from the Owner and obtain all permits at the Contractor's expense.
 - 3. Locate existing underground utilities in the areas of work. If utilities are to remain in place either temporarily or permanently, provide adequate means of protection during construction and earthwork operations.
 - 4. Utilities and existing conditions have been shown on the Contract Documents using the best information available. Actual locations may vary. Protect existing utilities and infrastructure to remain in service. Field verify depth and locations of existing utilities prior to installation of fuel lines, electrical conduits, other utilities and infrastructure. Notify the Owner's Representative of any discrepancies that potentially affect the plan location, profiles or construction of any work performed under this Contract and obtain direction prior to proceeding. Repair any damaged utilities to remain in service immediately as required or directed by the utility owner, Owner, Engineer, Owner's Representative or other entity having jurisdiction. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation.

1.05 QUALITY ASSURANCE

A. All materials and equipment and each part of detail of the work shall be subject at all times to observation by authorized representatives of the Owner, and inspection by governmental

agencies having jurisdiction.

1. Except where existing materials are specifically designated for reuse, all new first class materials shall be used throughout the work. Use of new products manufactured using salvaged, rusty, damaged, deteriorated or defective material is not acceptable unless approved by the Engineer prior to bidding.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 PERMITS

- A. Except as otherwise noted, the Contractor shall, for work under this Contract, obtain all permits and pay all fees associated therewith.
- B. Copies of all permits shall be filed with the Engineer.
- C. Copies of all permits shall be maintained at the site of the work.
- D. No work will be allowed to proceed until the required permits are obtained.

3.02 COOPERATION BETWEEN CONTRACTORS

- A. Separate Contracts may be awarded for work within or adjacent to the project site. The Contractor shall conduct his work so as not to interfere with or hinder the progress of work being performed by other contractors.
- B. Each Contractor shall assume all liability in connection with his Contract and shall not make claims that may arise because of the presence and operations of other Contractors.

3.03 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

A. The work shall be under the charge and care of the Contractor until accepted. The Contractor shall rebuild, repair, restore and make good, at his expense, all damages to his work occasioned by any cause.

3.04 CLEAN UP

- A. The Contractor shall keep the site of the work and adjacent areas free from materials, debris and rubbish as much as possible and shall remove at once if directed by the Owner.
- B. Before acceptance of the work, the Contractor shall remove all machinery, equipment, rubbish, barricades and signs, and leave the site in a neat and orderly manner.

3.05 ENVIRONMENTAL CONTROL

A. The Contractor shall comply with all statutes and regulations with respect to control of excessive noise and pollution of the air and water due to his construction operations, and shall obtain all permits that may be required by agencies having jurisdiction.

SECTION 024119.00 SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers demolition and removal of indicated structures, utilities, pavement, underground storage tanks and associated equipment and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the Contract Drawings.

1.02 RELATED SECTIONS

- A. Section 02 00 00 Sitework General Provisions
- B. Section 02 61 00 Excavation and Handling of Contaminated Materials
- C. Section 02 65 00 Underground Storage Tank Removal
- D. Section 02 83 13 Lead-Based and Lead-Containing Paint Abatement
- E. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, Section 33 52 43.00 – Fuel System General Provisions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

- A. American Petroleum Institute (API):
 - 1. Bulletin 1604-10 Closure of Underground Storage Tanks.
- B. Occupational Safety and Health Administration (OSHA):
 - 1. 29 CFR Part 1926-07 Safety and Health Regulations for Construction.
 - 2. 40 CFR 280-07 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks.

1.04 SYSTEM DESCRIPTION

A. Provide a description of the existing conditions and systems/equipment to be demolished including size and contents of storage tanks.

1.05 SUBMITTALS

- A. Submit as specified in Section 01 33 00.00 Compliance Submittals.
- B. Photographs or video as specified, sufficiently detailed, of existing conditions of adjoining construction and site infrastructure that might be construed or misconstrued as being damage by Contractor's demolition or construction operations.
 - 1. Photos of Existing Conditions
- C. Submit Bill of Sale or other appropriate documents for transfer of ownership of removed storage tanks.
 - 1. Storage Tank Bill of Sale
- D. Submit a copy of all permits and notifications obtained or required as part of Work.
 1. Construction Permits Demolition

1.06 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site. Disposition of materials shall be at Contractor's option.

1.07 REGULATORY AND SAFETY REQUIREMENTS

A. Regulatory Requirements: Comply with local, state and federal regulations including 29 CFR Part 1926. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 SALVAGED MATERIALS

- A. The following items are to be salvaged by Contractor and delivered to Owner at the directed location:
 - 1. Describe any salvage items as necessary
- B. Excluding those items listed in 2.01 A, no materials are to be salvaged or delivered to the Owner. Material and equipment designated to be demolished shall become the property of the Contractor.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Do not begin demolition until authorization is received from the Owner or Owner's Representative (OR). Remove rubbish and debris from the project site immediately as generated; do not allow accumulations on aircraft apron or work site. Store materials that cannot be removed daily in areas approved by the Owner or Owner's Representative. Demolished materials not being reused in the project cannot be stored within the project limits. Demolished materials being reused in the project can only be stored within the project limits as indicated, specified or approved by the Owner or Owner's Representative.

3.02 SCHEDULING

A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations or the work of other Contractors.

3.03 FOREIGN OBJECT DEBRIS (FOD) AND DUST CONTROL

- A. Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Maintain dust control in accordance with FAA requirements and comply with all directions issued during construction by the Airport Authority. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum the work area and sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage to aircraft.
- B. Aircraft and aircraft engines are subject to damage from debris and waste material lying on apron pavements. Remove immediately all such materials that may appear on operational aircraft pavements due to the Contractor's operations. Report or remove all such materials observed and not caused by Contractor operations. If necessary, the Engineer will require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of potential debris. Demolition operations involving buildings or other structures that are likely to result in wind blown debris such as roofing, paper, styrofoam or other FOD sources, shall have a temporary barrier to prevent the material from leaving the work limits. The barrier shall consist of a highly visible, low profile screen or fence designed to stop the spread of debris and be anchored properly to prevent displacement by winds or jet engine/propeller blasts. Remove barrier when no longer required.

3.04 PROTECTION

- A. Traffic Control Signs and Barriers
 - 1. Furnish, install and maintain traffic control signs, lights and barriers as needed to direct workers, maintain existing operations and prevent accidents related to the demolition operations performed under this contract. Devices shall comply with all requirements of the airport authority and FAA.
- B. Existing Work
 - 1. Protect existing work that is to remain in place, be reused, or remain the property of the Owner. Repair items that are to remain and which are damaged during performance of the work to their original condition, or replace with new. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement will be at Contractor's expense and must have approval of the Owner and Engineer.

3.05 INSPECTION OF EXISTING CONDITIONS

A. Prior to start of demolition work, inspect areas and facilities to be demolished. Photograph existing conditions of structures, pavement, equipment and other facilities that might be alleged or construed as being damaged by activities performed under this contract.

3.06 PREPARATION

- A. Provide shoring and bracing necessary to prevent settlement or collapse of structures being demolished or adjacent facilities to remain.
- B. Cease operations and notify Engineer immediately if unsafe conditions develop in the structures being demolished or adjacent structures are endangered.
- C. Identify, locate and disconnect utility services to be demolished.
- D. Identify, locate and protect all utility services in or near the demolition limits that remain in service and are not indicated to be demolished.

3.07 DEMOLITION

- A. General Site Demolition
 - 1. Perform demolition in a systematic manner using appropriate means and methods for the defined work scope.
 - 2. Saw cut masonry and concrete that will remain visible to full depth to provide clean separation limits between remaining and demolished materials. Walls and slabs that will be buried or otherwise hidden and do not connect to new construction do not have to be saw cut prior to demolition unless necessary to perform demolition and preserve structural integrity and function of infrastructure to remain.
 - 3. Demolish walls and foundations to a minimum of 5 feet below final grade. Break up all floor slabs that are to remain in place prior to backfilling.
 - 4. Demolish and remove all below grade wood or metal construction.
 - 5. Break up and remove all road and apron pavement, base and subbase where pavement demolition is indicated.
 - 6. Remove all fence fabric, posts, hardware and associated below ground construction such as concrete where fence demolition is indicated.
 - 7. Remove all fixtures, hardware, equipment, ladders, windows, doors, walls, floors, roofs and other elements of the structures shown to be demolished.
 - 8. No explosives will be permitted.
 - 9. Use sprinkling or other measures as appropriate to control the spread of dust and debris.
 - 10. Conform to all applicable laws and regulations.
- B. Removal of Existing Concrete Pavement
 - 1. The existing concrete to be removed shall be freed from the pavement to remain. This shall be accomplished by sawing through the complete depth of the slab. If existing load transfer devices are to be reused, drilling or saw cuts shall be one and a half feet inside the perimeter of the final removal limits shown on the contract drawings or outside the load transfer devices, whichever is greater.
 - 2. Where the removal limits are located on existing joints, the perimeter shall be saw cut to the full depth of the pavement and new load transfer devices installed. The pavements inside the saw cut may be broken or removed in whole slabs as determined most suitable by the Contractor. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines or drainage structures, the cathodic protection system, pavement under drains or pavement to remain in place. Utilize a full depth offset secondary cut in pavement and other locations where necessary, indicated or directed to protect existing pavement edges to remain from damage during demolition. Any damage shall be repaired by the Contractor at the Contractor's expense with no added expense to the Owner. Over sawing at intersections of pavement removal limits shall be held to an absolute minimum. The contractor may make full depth saw cuts at the limits of pavement removal through existing keyways, dowels or other load transfer devices provided new replacement dowels are installed with an equivalent load transfer capacity. Regardless of the demolition limits indicated, the Contractor shall make reasonable attempts make field adjustments where

necessary or directed to keep demolition cuts in logical locations along existing pavement joints and not leave small slivers or irregular strips of pavement.

- C. Demolition and Removal of Underground Fuel and Product Storage Tanks and Piping
 - 1. Underground Fuel or Product Storage Tanks shall be demolished and disposed of as indicated on the project drawings and specified in Section 02 65 00.00 Underground Storage Tank Removal.
 - 2. Storage tanks and piping previously contained the products described in Paragraph SYSTEM DESCRIPTION of this specification section. Contractor's employees shall be trained in the proper procedures for handling these materials. Follow procedures for permanent closure, storage, sale or disposal of tanks as provided in applicable sections of API Bulletin 1604.
 - 3. The Contractor shall remove fluids, debris, loose scale, liquid and sludge from the piping and tanks in accordance with industry standards. Waste material shall be transported to a properly permitted treatment, storage and disposal facility in accordance with local, state and federal regulations. Contractor shall provide appropriate devices and piping at terminus end of pipe to contain and capture any drained or dislodged product or sludge without spillage.
 - 4. Owner, Engineer, or Contractor shall be responsible for waste sampling as necessary to satisfy the disposal facility requirements.
 - 5. Remove tanks and all associated equipment. Upon removal, tanks shall be legibly and permanently labeled with the name of the former contents and appropriate warnings. Tanks shall be transported from the site on the same day they are extracted from the ground. Regardless of final tank disposition, a bill of sale, certificate of destruction or other satisfactory form of ownership transfer shall be provided to Owner.
 - 6. Contractor shall prepare shipping papers for fluid disposal, including manifests, to be signed by the Owner, who is the generator, before any shipments leave the premises.
 - 7. Generator copies of the waste-shipping manifest shall be returned to a specified representative of the Owner. Owner shall provide copies of the documents to the Contractor. Any disposal discrepancies identified by Owner, or others, shall be the responsibility of the Contractor and shall be resolved by the Contractor, the waste transporter and the disposal facility.

3.08 HAZARDOUS MATERIALS

- A. If hazardous materials are encountered during demolition operations, comply with applicable regulations and notify the Owner immediately. Obtain direction from Owner prior to proceeding.
- B. Owner's Representative shall be responsible for screening soil and groundwater for contamination. At the direction from Owner, Contractor may be required to perform additional excavation, handling and disposal of material exceeding applicable cleanup standards. Additional work shall be paid at the unit prices provided in the bid documents.

3.09 DISPOSITION OF MATERIAL

- A. Except where specified in other sections, all materials and equipment removed or demolished, shall become the property of the Contractor and shall be removed from Owner's property and legally disposed of or retained by the Contractor. The Owner will not be responsible for the condition or loss of, or damage to, such property prior to or after notice to proceed.
- B. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.
- C. Only soil or other materials approved by the Owner can be reused onsite.
- D. No burning will be permitted.

SECTION 026100.00 EXCAVATION AND HANDLING OF CONTAMINATED MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the excavation, loading and hauling of contaminated soil. Note the work included in this project is associated with an underground storage tank (UST) and dispensing system; therefore, the most appropriate management techniques from the oil pollution regulations are being utilized for this work.

1.02 RELATED SECTIONS

- A. 026500 Underground Storage Tank Removal
- B. Dewatering and Stormwater Management: SECTION 02093
- C. 310000.00 Site Preparation and Earthwork for Fueling

1.03 UNIT PRICES

- A. Handling of Unimpacted Soils is considered incidental to other work items being performed under this Contract and shall not be measured separately for payment.
- B. Management of Potentially Impacted Soil: Stockpiling and sampling of Potentially Impacted Soil and reuse of soils classified as Unregulated or Impacted after sampling will be paid at the unit prices set forth in the Bid Form. Unit prices will be determined based upon cubic yards using the physical dimensions of the associated stockpile.
- C. Off-Site Disposal: Hauling of soil from the excavated sites for off-site disposal at an Owner approved facility. Includes profiling of the soil, manifesting and disposal. This item will be paid at the unit prices set forth in the bid form. Unit prices will be determined based upon waste management tickets.

1.04 MEASUREMENT

- A. Management of Potentially Impacted Soil will be measured in "cubic yards".
- B. Off-site Landfarming shall be measured in "cubic yards".
- C. Off-Site Disposal shall be measured in "tons".

1.05 PAYMENT

- A. Payment will be made on the basis of approved units completed times the unit price stated in the Bid Form.
- B. Unit prices: Unit prices will include, permits, placarding, hauling, disposal and all other associated work and costs. Work performed under this Section will be paid at the unit price set forth in the Bid Form.

1.06 REFERENCES

- A. Code of Federal Regulations 40 CFR Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)
- B. Kansas Department of Health and Environment (KDHE) Underground Storage Tank Manual; current edition.
- C. KDHE Storage Tank Program Corrective Action Policy Manual; 2020.
- D. KDHE Special Waste Disposal Request Form (sw600)
- E. KDHE Application to Landfarm Petroleum Contaminated Soils Without a Permit (Form SWP900).
- F. Contractor's Stormwater Pollution Prevention Plan (SWPPP).

1.07 DEFINITIONS

A. Contaminated Materials:

026100.00 - Excavation and Handling of Contaminated Materials

- 1. Soil shall be considered Potentially Contaminated if visual or olfactory evidence of contamination is encountered or if photoionization detector (PID) readings exceed 10 parts per million (ppm). Following analytical testing, Potentially Contaminated soil shall be re-designated as Contaminated, Impacted, or Unregulated.
- 2. Soils shall be considered Unregulated if following screening there is no indication of contamination and soil is not from an area of suspected contamination, or if analytical results are below the laboratory's detectable limits for each analyzed Chemical of Concern (COC). Soil screening shall be conducted by Contractor's Environmental Professional (i.e., Consultant) and shall include screening with a PID and a visual and olfactory inspection.
- 3. Soil shall be considered Impacted if analytical results for one or more COCs are above laboratory detection limits but below established KDHE Petroleum Site Non-Residential Soil Remediation Levels (RLs) as listed in the .KDHE Storage Tank Program Corrective Action Policy Manual (page 10), dated October 9, 2020.
- 4. Soil shall be considered Contaminated if analytical results are above established RLs for at least one analyzed Chemical of Concern (COC).
- B. Chemicals of Concern for this work shall include those chemicals listed in the in the Kansas Petroleum Site Remediation Levels for Soil and Groundwater table provided in the KDHE Storage Tank Program Corrective Action Policy Manual (page 10), dated October 9, 2020.
- C. Disposal is the depositing, placing or dumping of any solid waste into or on any land so that such solid waste or any constituent thereof may not enter the environment or be emitted into the air or discharged into any waters.
- D. General Area of Work is defined as an area where there is no known source of contamination. All work areas outside a pteroleum or UST Area of Work are defines as a General Area of Work.
- E. UST Area of Work is defined as an area where UST removal activities are occurring as part of the project and petroleum contamination may be encountered.
- F. Petroleum Area of Work is defined as an area where visual or olfactory evidence of contamination is encountered during the project.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Contractor's personnel shall be properly trained to handle soil that contains contaminant concentrations above KDHE Non-Residential Soil RLs for identified COCs. These soils shall be given consideration in the Contractor's Health and Safety Plan.
- B. Immediately notify the Owner or Owner's Representative of suspected contamination .(i.e.,vapor screening levels greater than 10 ppm or visual and/or olfactory evidence of contamination) encountered in a General Area of Work or UST Area of Work. The Owner is responsible for all reporting requirements to the appropriate agencies.
- C. Set up an exclusion zone and limit access to contaminated work areas when necessary.
- D. Contractor's Environmental Professional will screen soil using a PID throughout excavation activities to categorize soil as Unregulated or Potentially Contaminated. PID screening will be performed at a frequency of one sample every 10 cubic yards inside a Petroleum or UST Area of Work.
- E. The Contractor's Environmental Professional shall collect samples from excavation for documentation purposes. If the excavation is unsafe for entry by field personnel, Contractor shall make a backhoe or other equipment available to obtain soil samples. Contractor shall include in his Bid, all costs for delays associated with the performance of the described screening and testing by the Engineer's Representative.
- F. To the extent practical, provide means to divert all surface water from the excavations and stockpile areas.

026100.00 - Excavation and Handling of Contaminated Materials

3.02 LOADING AND HAULING:

- A. Contractor shall segregate excavated soil as directed by the Owner's Representative into Potentially Contaminated soil and Unregulated soil.
- B. Contractor shall be responsible for obtaining, scheduling, and loading trucks for transportation of soil to the designated on-Airport Soil Stockpile Area. Hauling of soil shall be coordinated with the Airport with respect to time and routes.
- C. The on-Airport Soil Stockpile Area is designated for soil stockpiling only and not the stockpiling of construction debris.
- D. Contractor shall be responsible for hauling soil, which has been re-designated as Unregulated, from the Soil Stockpile Area to the Contractor's, Owner approved, disposal location. Loading at the Soil Stockpile Area to be performed by others.

3.03 TEMPORARY CONTAINMENT OF EXCAVATED SOIL

- A. Provide temporary containment area as designated by Airport.
- B. Cover containment area with 10 mil polyethylene sheeting.
 - 1. Place excavated soil on the impervious barrier and cover with 10 mil polyethylene sheeting.
 - 2. Provide straw bale berm around the outer limits of the containment area and cover with polyethylene sheets.
 - 3. Secure edges of sheets to keep the polyethylene sheeting in place.

3.04 SOIL ANALYTICAL TESTING

- A. The Contractor shall sample and analyze any Potentially Impacted stockpiled soil to evaluate its potential for use as backfill. A sample shall be collected every 500 cyd and analyzed by a Kansas certified laboratory for the COCs listed in the KDHE Storage Tank Program Corrective Action Policy Manual (page 10), dated October 9, 2020. The analytical results shall be provided to the Owner.
- B. Analytical results will be compared by the Contractor's Environmental Professional to the KDHE Non-Residential Soil RLs as indicated.
- C. Soil with non-detect analytical results shall be classified as Unregulated and can be reused anywhere within the project site. Soils with analytical results below the Non-Residential Soil RLs shall be classified as Impacted and can be reused as backfill in the original excavation pending KDHE approval or disposed or land farmed off-site.
- D. Soil with analytical results above the Non-Residential Soil RLs shall be classified as Contaminated and shall be transported off-site for disposal or landfarming. Sampling and analysis for off-site disposal purposes is the responsibility of the Contractor and may be different based on the disposal facility requirements than the sampling required by KDHE.

3.05 CONTAMINATED SOIL DISPOSAL

- A. The Contractor shall dispose of Contaminated Soil at an approved disposal facility or treat offsite, in accordance with applicable federal, state, and local regulations. The Contractor shall submit its proposed choice for off-site treatment (landfarming) or off-site disposal to the Owner or Owner's Representative for review and approval I The Contractor shall provide transportation manifests and disposal facility receipts to the Owner as documentation of the proper legal disposition of contaminated soil taken off-site for disposal. Hauling tickets will be used if the soil is taken off-site for landfarming. The manifests or haul tickets will be signed by an authorized representative of the Owner.
- B. Contractor shall complete a Special Waste Disposal Request Form (sw600) for submittal to KDHE to receive a Special Waste authorization number prior to transporting Contaminated Soil off-site for disposal.
- C. Contractor must obtain approval for off-site landfarming of Contaminated Soil by submitting the KDHE Application to Landfarm Petroleum Contaminated Soils Without a Permit (Form swp900).

026100.00 - Excavation and Handling of Contaminated Materials A landfarm operating plan is also required to be prepared.

D. Transportation for off-site disposal or landfarming of contaminated soils shall be in compliance with all applicable federal, state, and local codes and regulations.

3.06 WATER DISPOSAL

- A. Store and test water generated during removal of tanks and piping.
 - 1. If contaminated, transport and dispose of water at KDHE approved disposal or treatment facility in accordance with federal, state, and local requirements.
 - 2. Non-contaminated water may be disposed of on-site, pending approval from the Airport.

3.07 REPORTING

A. Reporting requirements associated with the excavation and handling of contaminated materials are described in SECTION 026500 - Underground Storage Tank Removal.

SECTION 026500.00 UNDERGROUND STORAGE TANK REMOVAL

PART 1 - GENERAL

1.01 SUMMARY

A. This item shall consist of all work required for the removal of fifteen (15) 50,000-gallon Jet A fuel underground storage tanks (USTs), fuel piping and associated equipment. The work shall be accomplished in accordance with these specifications and the Contract Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 024119.00 Selective Demolition
- B. Section 026100 Excavation and Handling of Contaminated Materials.
- C. Section 310000.00 Site Preparation and Earthwork for Fueling.
- D. Section 335243.00 Fuel System General Provisions

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200-Unit Prices, for general requirements applicable to unit prices related to removal and disposal of underground storage tanks.
- B. Unit Prices: Assume for bidding purposes that concrete slabs, bituminous pavement, soil and water encountered during the removal of the underground tanks are contaminated with Jet-A fuel and shall be handled as specified herein.
 - 1. Payment for removal from temporary stockpile and disposal of contaminated soil and furnishing clean soil shall be paid for at the contract unit price per cubic yard.
 - 2. Bituminous pavement and concrete slabs shall be washed and disposed of as demolition debris. Wash water shall be collected and stored.
 - 3. Disposal of contaminated water shall be paid for at the contract unit price per gallon.

1.04 REFERENCES

- A. API RP 1604 Closure of Underground Storage Tanks; 2021.
- B. API PUBL 1628 Guide to the Assessment and Remediation of Underground Petroleum Releases; 1996.
- C. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications; 2016.
- D. 29 CFR 1910 Occupational Safety and Health Standards; current edition.
- E. 29 CFR 1910.38 Emergency Action Plans; current edition.
- F. 29 CFR 1910.134 Respiratory Protection; current edition.
- G. 40 CFR 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks; current edition.
- H. EPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; current edition.
- I. EPA 600-4-790-20 Methods for Chemical Analysis of Water and Wastes; 1983.

1.05 KANSAS SPECIFIC REFERENCE STANDARDS

- A. Kansas Department of Health and Environment (KDHE) Underground Storage Tank Manual; current edition. *
- B. KDHE Storage Tank Program Corrective Action Policy Manual; 2020. *
- C. KDHE Underground Storage Tank Permanent Closure or Change-In-Service Notification Form (UST008); 2019.
- D. Contractor's Stormwater Pollution Prevention Plan (SWPPP).

1.06 SUBMITTALS

A. Submit as specified in Section 013300.

026500.00 - Underground Storage Tank Removal

- B. KDHE Permanent Closure or Change-In-Service Form (UST008) shall be submitted by Contractor at least 30 days prior to starting underground storage tank (UST) removal activities.
- C. Site Safety and Health Plan: Describe safety and health plan and procedures as related to underground tank removal and pipe removal, and as related to operations associated with petroleum contaminated soils and water.
- D. Excavation and Material Handling Plan: Describe methods, means, equipment, sequence of operations and schedule to be employed in defueling, cleaning, excavation, transport, and handling of underground storage tanks (USTs), and stockpiling of soil during underground tank and piping removal.
 - 1. Include methods of excavating, a material handling plan for the contaminated material, soil testing requirements, safety precautions and requirements, and water pumping and collection requirements.
 - 2. Include methods of excavating, a material handling plan for the contaminated material, soil testing requirements, safety precautions and requirements, and water pumping and collection requirements.
- E. Tank and Piping Removal and Disposal Plan: Describe methods, means, sequence of operations, and schedule to be employed in the testing, pumping, cleaning, de-vaporizing, inspecting, removal, and disposal of underground storage tanks and piping.
- F. Spill and Discharge Control Plan: Describe procedures and plan related to potential spills and discharge of contaminated soils and water.
- G. Reports
 - 1. UST Removal and Excavation Report. Environmental Professional shall prepare report and incorporate findings, records, figures, data and photographs and submit to KDHE Bureau of Environmental Remediation - Storage Tank Section within 30 days of completion of UST and piping removal activities.
 - 2. Laboratory testing reports, including location of soil excavated and associated photoionization detector (PID) readings, and sampling and test results for:
 - a. Kansas petroleum chemicals of concern (COCs) Site Remediation Levels for Soil and Groundwater listed on page 10 of the KDHE Storage Tank Program Corrective Action Policy Manual, dated October 9, 2020.
 - b. Waste characterization laboratory reports.
- H. Record Documents
 - 1. KDHE Underground Storage Tank Permanent Closure or Change-In-Service Notification (Form UST008); 2019.
 - 2. Results of excavation, including sketch showing location of underground storage tank, sampling locations, and extent of excavation.
 - 3. Tank disposal paperwork and method of conditioning tank for disposal.
 - 4. Contaminated soil disposal paperwork, such as laboratory testing reports and disposal manifests.
 - 5. Contaminated water disposal paperwork, such as laboratory testing results and disposal/treatment manifests.
 - 6. KDHE Special Waste Disposal Authorization Form SW600 (if impacted soils taken off-site for disposal)
 - 7. KDHE Application to Landfarm Petroleum Contaminated Soils Without a Permit (Form SWP900).
 - 8. KDHE Permanent Tank Abandonment Form.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with Kansas UST removal requirements, 40 CFR 280 and local regulations.
- B. Qualifications: Prior to the start of work, submit documentation of Kansas Licensed UST Contractor and Qualified Environmental Professional (i.e., Consultant) working on the project.
- 1. Data shall indicate that tank removal contractor, subcontractors, and personnel employed on the project have been engaged in removal, transportation, and disposal of underground tanks and associated piping, are familiar with and shall abide with the following:
 - a. API RP 1604
 - b. 40 CFR 280, KDHE and local regulations and procedures.
 - c. Provide documentation that tank removers are certified if locality of project has this requirement.
- C. References: Furnish data proving experience on at least three prior projects that included types of activities similar to those in this project. Provide project titles, dates of projects, owners of projects, point of contact for each project, and phone numbers of each point of contact.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plastic sheeting: ASTM D4397.

2.02 FILL MATERIAL

- A. Provide and place clean fill material as specified in Section 310000.00 Site Preparation and Earthwork for Fueling.
- B. Backfill UST excavations in accordance with the clean fill material requirements in the 2020 KDHE Storage Tank Program Corrective Action Policy Manual (page 6).
- C. Reuse uncontaminated soil obtained from the UST excavation as determined by Owner's Representative pending approval from KDHE Storage Tank Section .

PART 3 - EXECUTION

3.01 PREPARATION FOR TANK REMOVAL AND DISPOSAL

- A. Kansas Licensed UST Contractor must notify KDHE Northeast District Office at least three (3) working days prior to starting UST and piping removal activities.
- B. Site Safety And Health Plan (SSHP): Furnish safety, health, and accident prevention provisions and develop a Site Safety and Health Plan (SSHP).
- C. Spill And Discharge Control Plan: Develop, implement, and maintain a comprehensive spill and discharge control plan.
 - 1. The plan shall provide contingency measures for potential spills and discharges from handling and transportation of contaminated soils and water.
 - 2. A possible source of guidance for assessment and remediation is API PUBL 1628.
- D. Exclusion Zone (EZ) And Contamination Reduction Zone (CRZ): Do not permit personnel not directly involved with the project to enter work zones, called the EZ and CRZ.
 - 1. The EZ shall be an area around the tanks and piping a minimum of 10 feet (3 m) from the limits of the tank excavation.
 - 2. Within the CRZ, equipment and personnel shall be cleaned as stated in the paragraph entitled "Personnel and Equipment Decontamination."
 - 3. The Contractor's site office, parking area, and other support facilities shall be located outside the EZ and CRZ.
 - 4. Clearly mark and post the boundaries of the EZ and CRZ.
 - 5. Include a site map, outlining the extent of work zones and location of support facilities, in the SSHP.
- E. Training: Provide health and safety training in accordance with 29 CFR 1910 prior to starting work.
 - 1. Furnish copies of current training certification statements for personnel prior to initial entry into the work site.
- F. Personnel Protection: Furnish appropriate personal safety equipment and protective clothing to personnel.
- G. Decontamination: Decontaminate or properly dispose of personal protective equipment and clothing worn in contaminated areas at the end of the work day.

- H. First Aid And Emergency Response Equipment And Procedures: Provide appropriate emergency first aid equipment for treatment of exposure to site physical and chemical hazards.
 - Provide and post a list of emergency phone numbers and points of contact for fire, 1. hospital, police, ambulance, and other necessary contacts.
 - Provide and post a route map detailing the directions to the nearest medical facility. 2.
- Ignition Sources: Do not permit ignition sources in the EZ and CRZ. Ι.
- Personnel And Equipment Decontamination: Decontaminate personnel and equipment before J. exiting the work zones.
- Waste Disposal: The SSHP shall detail the practices and procedures to be utilized to dispose of K. wastes. Upon completion of the project, certify that equipment and materials were properly decontaminated prior to being removed from the site.
- Emergency Response Requirements: Furnish emergency response and contingency plan in L. accordance with 29 CFR 1910.38.
- Unforeseen Hazards: Notify the Owner or Owner's Representative of any unforeseen hazard or М. condition that becomes evident during work.

3.02 TANK CLEANING

- A. Fuel Removal:
 - 1. All possible fuel will be pumped or otherwise removed from the tank by Owner.
 - 2. Licensed UST Removal Contractor shall dispose of remaining fuel emulsions in accordance with applicable local, state, and federal regulations.
- B. Preparation: API RP 1604. Remove the fill pipe, gauge pipe, vapor recovery truck connection, submersible pumps, and drop tube.
 - Cap or remove non-product piping, except vent piping. 1.
 - Plug tank openings so that vapors will exit through vent piping during the vapor-freeing 2. process.
- C. Purging: Remove flammable vapors in accordance with API RP 1604. Tanks shall be certified as "vapor free" prior to further work.
- D. Cleaning and Testing: Provide clean and vapor free tank in accordance with API RP 1604 and the following Table of Tank History:
 - Tank No. [____]: [____]. 1.
 - a. Location: [____]. b. Capacity: [___].

 - c. Date Constructed: [].
 - d. Type of Lining (if applicable): [].
 - e. Type of Fuel: [].
 - Remarks from Last Inspection: []. f

3.03 EXCAVATION

- Provide Owner or Owner's Representative written documentation, no later than 30 days before A. work begins, that KDHE Storage Tank Section and local authorities (Fire Department, etc.) have been notified of planned UST and piping removal activities.
- B. Notify Kansas Northeast District Office at least three working days prior to start of UST and piping removal activities.
- Excavation Methods: Licensed Tank Remover shall excavate as required to remove tanks and C. piping. Contractor shall select methods and equipment to remove soil to minimize disturbance to areas beyond the limits of the excavation area.
 - Provide protection measures around the excavation area to prevent water runoff and to 1. contain the soil within the excavation area.
 - Contractor's Environmental Professional shall be responsible for screening soil and 2. groundwater for contamination. Soil excavation within the UST Area of Work shall be constantly monitored and soil screening will be performed at a frequency of one sample

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for every 10 cubic yards using a photo-ionization detector (PID). Soils with PID readings of 10 parts per million (ppm) or greater and indicative of contamination shall be temporarily stockpiled on-site for laboratory testing.

3. At the direction from Owner or Owner's Representative, Contractor may be required to perform additional excavation, handling and disposal of material exceeding applicable cleanup standards. Additional work shall be paid at the unit prices provided in the bid documents.

3.04 TEMPORARY CONTAINMENT OF STOCKPILED EXCAVATED SOIL

- A. Provide temporary containment area as designated by Airport.
- B. Cover containment area with 10 mil polyethylene sheeting.
 - 1. Place excavated soil on the impervious barrier and cover with 10 mil (0.15 mm) mil polyethylene sheeting.
 - 2. Provide straw bale berm around the outer limits of the containment area and cover with polyethylene sheets.
 - 3. Secure edges of sheets to keep the polyethylene sheeting in place.

3.05 REMOVAL AND ABANDONMENT OF UNDERGROUND STORAGE TANKS

- A. Underground storage tanks previously contained Jet-A fuel. Contractor's employees shall be trained in the proper procedures for handling this material. Follow procedures for permanent closure, storage, sale or disposal of tanks as provided in applicable sections of API Bulletin 1604.
- B. Empty all product piping into the tank and disconnect piping from the system.1. Demolish associated product piping as indicated and specified.
- C. The Contractor shall remove fluids, debris, loose scale, liquid and sludge from the piping and tanks in accordance with industry standards. Waste material shall be transported to a properly permitted treatment, storage and disposal facility in accordance with local, state and federal regulations.
- D. Contractor's Environmental Professional shall be responsible for waste sampling as necessary to dispose of tank rinsate and sludge materials.
- E. Remove tanks and all associated equipment. Upon removal, tanks shall be legibly and permanently labeled with the name of the former contents and appropriate warnings. Tanks shall be transported from the site on the same day they are extracted from the ground. Regardless of final tank disposition, a bill of sale, certificate of destruction or other satisfactory form of ownership transfer shall be provided to Owner.
- F. If present, Owner or Owner's Representative may require removal of hold down slabs if contamination is observed on or around the slab.
- G. Contractor shall prepare shipping papers for fluid disposal, including manifests, to be signed by the Owner, who is the generator, before any shipments leave the premises.
- H. Generator copies of the waste-shipping manifest shall be returned to a specified representative of the Owner. Owner shall provide copies of the documents to the Contractor. Any disposal discrepancies identified by Owner, or others, shall be the responsibility of the Contractor and shall be resolved by the Contractor, the waste transporter and the disposal facility.

3.06 TESTING

- A. Stockpiled Soils: Soils with PID readings of 10 ppm or greater shall be sampled and tested by the Contractor's Environmental Professional.
 - Test soils for chemicals of concern (COC) listed in the Kansas Petroleum Site Remediation Levels for Soil and Groundwater table provided in the KDHE Storage Tank Program Corrective Action Policy Manual (page 10), dated October 9, 2020. Laboratory analysis must be performed by a Kansas certified laboratory using KDHE approved analytical methods.
 - 2. Test samples for waste characterization parameters per proposed disposal facility acceptance requirements using a Kansas certified laboratory.

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- 3. Soils with COC concentrations above KDHE Non-Residential Soil Remediation Levels are considered contaminated materials and will be taken off-site for disposal or landfarming.
- 4. Soils with COC concentrations below KDHE Non-Residential Soil Remediation Levels are considered impacted and may be returned to the original excavation as fill pending approval from KDHE Storage Tank Section, or taken off-site for disposal or landfarming.
- 5. Soil with non-detectable concentrations of COCs are considered uncontaminated and may be used as fill material on-site.
- 6. Furnish sampling results to Owner or Owner's Representative within 24 hours after the results are obtained.
- B. UST Site Assessment Sampling:
 - 1. After removal of the USTs, Contractor's Environmental Professional shall collect soil samples for laboratory analysis from the sidewalls and floor of the excavations. All samples shall be collected at approximately one (1) foot into native soil.
 - 2. Four (4) samples shall be collected beneath each tank: one sample will be collected at each end of the tank and two (2) samples will be collected from the middle sections of the tank or beneath the fill port and vent line. Additional samples shall be collected in areas exhibiting visual and/or olfactory evidence of a release. If USTs are anchored to concrete slabs, Contractor's Environmental Professional shall notify KDHE Storage Tank Section for direction with respect to the collection of floor samples.
 - 3. A minimum of one soil sample will be collected from each sidewall of the tank excavations. Additional samples shall be collected in areas exhibiting visual and/or olfactory evidence of a release.
 - 4. One soil sample shall be collected from the floor of the trench for every 20 feet of underground product delivery piping, at every bend or turn in direction, and at every mechanical joint. Samples will also be collected in areas exhibiting visual and/or olfactory evidence of a release.
 - 5. Soil samples will also be collected from the UST excavations and piping trenches in areas where PID screening results are above 10 parts per million.
 - 6. Soil samples shall be analyzed for the COCs listed in KDHE Storage Tank Program Corrective Action Policy Manual (page 10), dated October 9, 2020. Laboratory analysis must be performed by a Kansas certified laboratory using KDHE approved analytical methods.
 - 7. Soils with COC concentrations above KDHE Non-Residential Soil Remediation Levels are considered contaminated materials and will be taken off-site for disposal or landfarming.
 - 8. Soils with COC concentrations below KDHE Non-Residential Soil Remediation Levels are considered impacted and may be returned to the original excavation as fill pending approval from KDHE Storage Tank Section, or taken off-site for disposal or landfarming.
 - 9. Soil with non-detectable concentrations of COC are considered uncontaminated and may be used as fill material on-site.
 - 10. Furnish sampling results to Owner or Owner's Representative within 24 hours after the results are obtained.

3.07 CONTAMINATED SOIL DISPOSAL OR LANDFARMING

- A. Disposal: Off-site disposal of petroleum-impacted soils will require Contractor to complete a KDHE Special Waste Disposal Request Form (sw600) to obtain a Special Waste authorization number prior to transporting soil off-site for disposal as discussed in Section 026100.
- B. Landfarming: As specified in Section 026100, off-site landfarming of impacted soils will require Contractor to submit KDHE Application to Landfarm Petroleum Contaminated Soils Without a Permit (Form swp900) and develop a landfarm operating plan for approval to treat soils off-site.

3.08 WATER DISPOSAL

- A. Dewatering will be permitted only with approval of Owner or Owner's Representative.
- B. Store and test water generated during removal of tanks and piping.
 - 1. If contaminated, transport and dispose of water at KDHE approved disposal or treatment facility in accordance with federal, state, and local requirements.

026500.00 - Underground Storage Tank Removal 2. Non-contaminated water may be disposed of on-site, pending approval from Airport Environmental staff.

3.09 DISPOSAL OF UNDERGROUND TANKS AND ASSOCIATED PIPING

- A. Tank Removal and Disposal:
 - 1. Plug or cap accessible holes. One plug shall have a minimum 1/8 inch (3 mm) vent hole.
 - 2. Remove tank from the excavation, place it on a level surface and render it useless in accordance with API RP 1604.
 - 3. Provide warning labels on tank if tank, as follows:
 - a. "TANK HAS CONTAINED JET-A FUEL NOT VAPOR FREE NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION -- DATE OF REMOVAL: MONTH/DAY/YEAR"
 - 4. Transport and dispose of tanks at a KDHE approved disposal facility.
- B. Piping Removal and Disposal
 - 1. Distribution (product delivery) piping shall be cleaned and removed.
 - 2. Transport and dispose of piping at a KDHE approved disposal facility.

3.10 BACKFILL AND COMPACTION

- A. Construct to the depths, contours, and elevations indicated and as specified, using suitable approved material from excavation and borrow areas.
- B. Place materials as specified for fill in Section 31 00 00.00 Site Preparation and Earthwork for Fueling.
- C. Backfill tank excavations with washed gravel or washed concrete aggregate from the bottom of the excavation to within 5 feet of the ground surface in accordance with KDHE requirements. The top 5 feet of the excavation will be filled with a compactable clay as described in the KDHE Storage Tank Program Corrective Action Policy Manual (page 6), dated October 9, 2020.

3.11 UST REMOVAL AND EXCAVATION REPORT

- A. Contractor's Environmental Professional shall prepare and provide a UST Removal and Excavation Report and supporting documentation to KDHE Bureau of Environmental Remediation - Storage Tank Section within 30 days of completion of UST and piping closure activities. The report shall include the following data:
 - 1. Site diagrams showing location of USTs and piping runs removed, UST and piping sample locations, and other pertinent information to be provided in Appendix 1 of the closure report.
 - 2. Laboratory testing reports from the Kansas certified laboratory including completed chain of custody forms.
 - 3. Tank cleaning paperwork including a signed statement from party that performed tank cleaning, and certificates of disposal for each tank removed.
 - 4. Documention of the proper disposal of contaminated soil (e.g., landfill disposal receipts) and contaminated water from the excavations.
 - 5. A section containing color photographs documenting all phases of UST and piping closure activities.

END OF SECTION

SECTION 028313.00 LEAD-BASED AND LEAD-CONTAINING PAINT ABATEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. This section covers the furnishing of all labor, materials, facilities, equipment, services employee training, testing, and permits necessary to perform the Work required for lead-based and lead-containing paint abatement in accordance with these specifications, regulations promulgated by the Environmental Protection Agency (EPA) and Occupational Safety and Health & Health Administration (OSHA) and guidance set forth in NIOSH guidelines, and any other applicable federal, state, and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.
 - 1. The following specifications are intended to be minimum requirements for abatement of all lead-based and lead-containing paint as required for demolition of the Tank Farm Building 1 and 2 and transportation and disposal of lead paint waste. The CONTRACTOR shall be responsible for determining means and methods for abatement of the specific material encountered and to be abated.
- B. The OWNER commissioned lead paint testing for the Tank Farm Buildings scheduled to be demolished as part of this work. The results of the testing activities are documented in the report provided in Appendix A prepared by . The lead paint sampling performed in this report was deemed appropriate at the time; however, it is the CONTRACTOR'S responsibility to ensure that all necessary testing has occurred. Abatement prior to demolition is not required based upon the results provided in Appendix A, which identified the presence of lead-containing paint but not lead-based paint. However, if the CONTRACTOR determines abatement is necessary it is to be conducted in accordance with this specification. Building debris is to be disposed at an approved landfill after required testing.

1.02 REFERENCES

- A. ASTM Standard E1729 Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques
- B. ASTM Standard E1741 Standard Practice for Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities
- C. OSHA 29 CRF 1926.62 Construction Industry Standard for Lead
- D. EPA 40 CFR 240-290, 403, and 503 Resource Conservation and Recovery Act (RCRA) Hazardous Waste Regulations

1.03 DEFINITIONS

A. Abatement: Measures defined in 40 CFR 745, Section 223, designed to permanently eliminate lead-based paint hazards.

1.04 SYSTEM DESCRIPTION

A. Contractor shall perform abatement of lead-based paint on building materials when necessary to eliminate exposure to lead during demolition of Tank Farm Buildings 1 and 2. See attached lead-based paint survey report prepared by Contractor shall dispose of all known materials containing lead at an approved disposal facility.

1.05 SUBMITTALS

- A. Submit as specified in Section 01 33 00.00.
- B. Submit lead-based paint abatement contractor qualifications, certifications, licenses and permits.
- C. Employee training certifications.
- D. Competent person qualifications.
- E. Waste Mangement Plan.
- F. Sampling data.

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- G. Quality Assurance
 - 1. Qualification Statements
 - a. Submit copies of: licenses, certifications and registration documents for all companies and workers used; notifications of Work to be conducted at the site; and all correspondence between the regulatory agencies and the CONTRACTOR (and/or any subcontractor) regarding Work at the site. All information must be provided to the OWNER in a timely manner via first class mail or hand delivered (copies mailed to the OWNER on the day of receipt from regulatory agencies or on the day they are sent to the regulatory agency).
 - 2. Certifications
 - a. Waste disposal location certification as well as transport methods and certification.
 - b. Copies of all employee training certificates.
 - 3. Field Samples
- H. Closeout Submittals
 - 1. Waste manifests

1.06 QUALIFICATION REQUIREMENTS

- A. The CONTRACTOR'S personnel assigned to the Project shall have the qualifications listed below. These items shall be included in submittals within five (5) calendar days after the Notice to Proceed as proof of compliance.
 - 1. Superintendent and Supervisor: The CONTRACTOR shall have on the site at all times during performance of this Agreement and until the Work is completed and accepted a competent representative who has full authority to act for the CONTRACTOR at all times when work or services are being performed.
 - 2. During any period of actual abatement of lead-based or lead-containing paint, the Abatement Supervisor shall be stationed within the containment area at least twenty-five percent (25%) of the time for the purpose of supervising the progress of the abatement work. The Abatement Supervisor shall have the following characteristics:
 - a. Training and knowledge of applicable regulations and expertise in safety and environmental protection as evidenced by the participation and successful completion of a training course offered by an EPA endorsed educational institution. A "NESHAP TRAINED PERSON" shall be on-site when lead-based or lead-containing paint is stripped, removed, or disturbed.
 - b. Meet federal, state, and local requirements for training. Training shall be provided by an accredited training provider certified by the State of Kansas Department of Health and Environment.
 - c. Possess all required valid, current licenses and certificates. Legible copies of all licenses must be on file with the OWNER.
 - d. Experience with abatement work as evidenced through participation in at least three (3) lead-based paint abatement projects of similar size and complexity to this project.
 - e. Medical records. Statement signed by examining physician, including, but not limited to, the following:
 - 1) Employee's general health condition.
 - 2) Evidence of existing medical conditions that may be aggravated by lead-based paint abatement activities.
 - 3) Employee's ability to work under containment restrictions, including pulmonary function necessary to compensate for stress produced by respiratory protection.
 - 4) Medical examination required by OSHA.
 - f. Have all information required by the Hazard Communication Standard including Material Safety Data Sheets (MSDS) and signs.
 - 3. The lead worker must have specialized training in lead abatement which meets State and Local requirements.
 - a. Meet federal, state, and local requirements for training. Training shall be provided by an accredited training provider certified by the State of Kansas Department of Health and Environment.

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b. Employees exposed to lead at or above the action level of 30 µg/m3 on any day must be provided additional medical surveillance in accordance with 29 CFR 1926.62.

1.07 NOTIFICATIONS

- A. OWNER must be notified of lead-based or lead-containing paint abatement work at least 24 hours prior to commencement. Copies of the notices to any and all regulatory agencies and copies of all correspondence between regulatory agencies and the CONTRACTOR (or subcontractors) regarding Work at the Site shall be submitted to the OWNER.
- B. Commencement of lead-based or lead-containing paint abatement is defined as the date upon which the CONTRACTOR begins construction of any Abatement Area containment structures.
- C. The CONTRACTOR shall not commence Work until the aforesaid notices have been made. Nothing herein shall relieve the CONTRACTOR of the responsibility for said notices.

1.08 REFERENCES

- A. ASTM Standard E1729 Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques
- B. ASTM Standard E1741 Standard Practice for Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities
- C. OSHA 29 CRF 1926.62 Construction Industry Standard for Lead
- D. EPA 40 CFR 240-290, 403, and 503 Resource Conservation and Recovery Act (RCRA) Hazardous Waste Regulations

1.09 EMERGENCY PRECAUTIONS

- A. The CONTRACTOR shall establish emergency and fire exits from the Work Area.
- B. The CONTRACTOR shall be prepared to provide first aid to injured personnel after decontamination has started. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
- C. Employees shall be trained in evacuation procedures in the event of work area emergencies.
 - 1. For non-life threatening situations, employees injured or otherwise incapacitated shall decontaminate themselves following normal procedures, with assistance from fellow workers if necessary, before exiting the Work Area to obtain proper medical treatment.
 - 2. For life-threatening situations, workers decontamination shall be done only if it will not jeopardize the worker's chances of recovery.
- D. The location of the nearest telephone and telephone numbers of all emergency response personnel shall be prominently posted in the Tank Farm Buildings.

PART 2 - MATERIALS

2.01 RESPIRATORY SYSTEM

- A. The CONTRACTOR shall provide respiratory equipment approved by NIOSH and MSHA to all workers, foremen, superintendents, authorized visitors, and inspectors. Equipment shall be issued and individually marked for each person.
- B. Alternate respiratory protection systems proposed by the CONTRACTOR may be considered; documentation of the effectiveness of such systems shall be in the form of professional industrial hygienist recommendations.

2.02 TOOLS AND EQUIPMENT

- A. Scaffolding Scaffolding, as required to accomplish the Work, shall meet all applicable state and federal safety regulations.
- B. Transportation Equipment Transportation equipment, as required, shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without exposure to persons or property.
- C. Vacuum Equipment All vacuum equipment utilized in the Work Area shall Utilize HEPA filtration systems.

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D. Other Tools and Equipment – The CONTRACTOR shall provide all tools for the removal and disposal activities.

PART 3 - EXECUTION

3.01 EXPOSURE ASSESSMENT

- A. The CONTRACTOR shall conduct an exposure assessment in accordance with 29 CFR 1926.62 that is representative of the exposure to lead of each employee.
- B. The use of objective data, i.e. assuming that materials with less than 0.06% lead by weight will not result in exposures above the Action level, is not appropriate when trigger tasks such as sanding, scraping, abrasive blasting, building demolition, etc. are being conducted. Therefore, determination of airborne lead concentrations may require air monitoring during demolition.
- C. Until the exposure assessment is conducted, the CONTRACTOR shall treat the employee as if they were exposed and provide proper protection according to the conditions outlined in 29 CFR 1926.62.
- D. Once the initial assessment is completed, appropriate protections must be provided as outlined below to reduce the employee exposure to lead to below the PEL.
- E. The frequency of exposure assessment must be at the beginning of each task for which no exposure data exists.
- F. Additional exposure assessment will be conducted whenever the process or operation changes.

3.02 PRE-LEAD-BASED AND LEAD-CONTAINING PAINT ABATEMENT PREPARATIONS

- A. The CONTRACTOR shall establish a regulated area that is appropriately demarcated.
- B. The Abatement Area should be cleared of all personnel, and all movable objects before the Work commences unless specified otherwise.
- C. It is the responsibility of the CONTRACTOR to secure the area and maintain containment area integrity or distance from the work site to ensure safety of all personnel, and that no cross contamination occurs.

3.03 SIGNAGE

- A. The CONTRACTOR shall post warning signs in each regulated area or work area where an employee exposure to lead may be above the PEL.
- B. The CONTRACTOR is responsible for providing any additional signs required by other statutes or regulations.

3.04 MEDICAL SURVEILLANCE

A. The CONTRACTOR shall provide medical surveillance to employees as outlined in 29 CFR 1926.62.

3.05 RESPIRATORY PROTECTION

- A. The CONTRACTOR shall provide respiratory protection as outlined in 29 CFR 1926.62 when an employee's exposure to lead exceeds the PEL, when engineering controls and work practices are not sufficient to reduce exposures of lead to below the PEL, for interim protection prior to an exposure assessment, and if an employee requests one. The CONTRACTOR shall select the appropriate respirator according to 29 CFR 1926.62.
- B. The CONTRACTOR must implement a respiratory protection program in accordance with 29 CFR 1926.62(f) and 29 CFR 1910.134 as applicable.
- C. The CONTRACTOR must provide fit tests and medical examinations in accordance with 29 CFR 1926.62(f) and 29 CFR 1910.134 to determine if the employee can use a respirator while performing required duties.

3.06 PERSONNEL PROTECTION

A. CONTRACTOR shall provide protective disposable clothing, eye protection and hard hats as required by job conditions and safety regulations and as required by 29 CFR 1926 Subpart C.

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B. CONTRACTOR shall establish regulated areas prior to work being conducted in accordance with 29 CFR 1926.62. A regulated area is any area where employees are exposed to lead at or above the PEL. The regulated area shall be posted with signs and access shall be restricted to those employees with proper training and personal protection equipment. Food, beverages, and tobacco products cannot be stored or consumed in a regulated area.

3.07 REMOVAL

- A. Removal shall be accomplished by use of the most appropriate method as selected by the CONTRACTOR. The selected abatement method must be detailed in the Standard Operating Procedure provided with the Lead Compliance Plan.
- B. Cleanup shall be continuous. All debris and waste generated from the paint removal process shall be removed by the CONTRACTOR and disposed of offsite, at his expense, in accordance with the specification and Federal, State, and Local laws.
- C. A visual inspection will be performed by the abatement supervisor after completion of work each day to ensure the hazardous paint is adequately removed and all removed debris is cleaned up. Accumulated lead dust in the work areas shall be removed on a daily basis by HEPA filtered vacuum and wet mopping or other appropriate method.

3.08 AIR MONITORING AND INSPECTION:

- A. The CONTRACTOR will perform personal exposure assessment in compliance with 29 CFR 1926.62 if a negative exposure assessment is not available. The CONTRACTOR will perform ambient exposure air monitoring as required by 29 CFR 1926.62.
- B. It is recommended that at least one employee for each job classification on each shift or on the shift with the highest exposure potential be monitored for the purpose of determining the degree of PPE. All records shall be maintained as required by OSHA.
- C. Final clearance sampling shall be performed by the CONTRACTOR at the end of the operation if work area samples exceeded the action level of 30 μg/m3. Samples must be collected from inside the work area and must be less than 30 μg/m3 for clearance. If a negative exposure assessment was available no final clearance monitoring is required.

3.09 DECONTAMINATION

- A. The CONTRACTOR will establish hygiene facilities for all lead demolition jobs where the employees may be exposed to lead above the PEL without regard for respirators. The hygiene facilities shall be stationary and constructed before work begins.
- B. The hygiene facilities shall conform to 29 CFR 1926.62.
- C. Separate hand washing facilities shall be provided for all employees exposed to any level of lead. Hands and face shall be washed prior to eating, drinking, or smoking outside the work area.

3.10 WASTE DISPOSAL

- A. Demolished tank and piping material shall be transported to an OWNER approved scrap metal recycling facility or Construction and Demolition Waste disposal facility without abatement of paint. Procedures for packaging and transporting materials shall be provided in the Standard Operating Procedure. All materials shall be transported in accordance with all local, state and federal regulations. Material manifests shall be provided to the OWNER upon completion of the work.
- B. TCLP Testing for Disposal: The CONTRACTOR must provide representative laboratory testing results to define the hazardous characteristics of all paint containing waste materials produced. Testing on lead-based and lead-containing paint abatement waste material by use of the Toxicity Characteristic Leachate Procedure (TCLP) test for lead, EPA Method 1311/6010B, shall be completed by CONTRACTOR and results shall be supplied to the OWNER for record keeping. The representative sample shall be submitted to and analyzed by a laboratory accredited by the American Industrial Hygiene Association /Environmental Lead Laboratory Accreditation Program (ELLAP) and certified by the State of Kansas. The solid waste components with lead paint shall be tested for lead using the TCLP method. Lead

concentrations below the TCLP regulatory level of 5.0 milligrams per liter (mg/L) for characteristically hazardous lead waste may be acceptable for non-hazardous solid waste disposal. In contrast, lead concentrations above the TCLP regulatory level of 5.0 mg/L are classified as hazardous waste.

- C. The CONTRACTOR shall determine whether additional testing for compounds other than lead is required for special handling or disposal. The CONTRACTOR shall contact the regional EPA, State, and Local authorities and disposal location to confirm their requirements and to determine any and all lead waste management requirements. Those wastes determined to be hazardous will require special handling and disposal according to applicable regulations, at a significantly higher cost than would be required to dispose of solid waste. However, segregation of materials and other handling techniques can minimize the amount of hazardous waste.
 - 1. The Lead Abatement CONTRACTOR shall properly manage and dispose of all disposal cleaning materials such as sponges, filters, and disposable clothing.
 - 2. The Lead Abatement CONTRACTOR shall properly manage and dispose of any solvents or chemicals if used in the lead abatement process.
 - 3. The Lead Abatement CONTRACTOR shall comply with the applicable requirements of RCRA and any other applicable Federal, State, or Local regulations for the final disposal of the regulated material.
 - 4. All lead-contaminated waste, debris, clothing, etc. must be labeled in accordance with 29 CFR 1926.62.
 - 5. Abated lead-contaminated material may be temporarily stored on the project site as long at the material is stored in a secure fashion, is in DOT approved containers, and is properly labeled.
 - 6. The CONTRACTOR shall comply with EPA and DOT regulation for transport.
 - 7. All waste disposal shall be at the CONTRACTOR'S expense.
 - 8. All waste manifests must be signed by the OWNER or its authorized designee.
 - 9. The CONTRACTOR shall provide copies of all manifests for transportation and disposal of wastes to the OWNER.

END OF SECTION

SECTION 033000.00 CAST-IN-PLACE CONCRETE FOR FUELING

GENERAL

1.01 SUMMARY

A. Work under this section shall include concrete reinforcement, formwork and Portland cement concrete for cast-in-place structures, equipment pads and other miscellaneous concrete work related to this contract and not specified elsewhere.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections apply to this Section.
- B. Section 31 00 00.00 Site Preparation and Earthwork (for Fueling)
- C. Section 33 52 43.00 Fuel System General Provisions

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C31 Making and Curing Concrete Test Specimens in the Field.
 - 2. C33 Standard Specification for Concrete Aggregates.
 - 3. C39 Compressive Strength on Cylindrical Concrete Specimens.
 - 4. C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 5. C117 Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Impact in the Los Angeles Machine.
 - 6. C131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 7. C136 Sieve Analysis of Fine and Coarse Aggregates.
 - 8. C144 Aggregate for Masonry Mortar.
 - 9. C150 Portland Cement.
 - 10. C618 Coal Fly Ash and Raw or Calcined Natural Pozzolans for Use as a Mineral Admixture in Concrete.
- B. American Concrete Institute (ACI):
 - 1. ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete.

1.04 SUBMITTALS

- A. General: Submit the following according to conditions of the Contract and Division 1.
- B. Product data for materials, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, release agents and other materials requested by Engineer.
- C. Shop drawings for reinforcement detailing fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.
- D. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces.
 - 1. Engineer's review is for general applications and features only. Designing formwork for structural stability, safety and efficiency is the Contractor's responsibility.
- E. Laboratory test reports for concrete materials and mix design test, including cement, aggregates and admixtures.
- F. Material certificates in lieu of material laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.05 PROJECT/SITE CONDITIONS

A. Portions of structures constructed under this contract may be below the water table. The Contractor is responsible for dewatering and otherwise maintaining acceptable construction conditions necessary for proper installation.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Tests of all Contractor-secured materials and products being submitted for approval to determine conformance with all requirements of these specifications proposed for use, shall be performed by an independent, testing laboratory retained and compensated by the Owner.
- C. As materials are incorporated into the Project, on-site and off-site quality control tests will be performed during construction to determine conformance with Drawings and Specifications by an independent testing laboratory retained and compensated by the Owner. Frequency of on-site and off-site testing is specified in PART 3.
- D. Preinstallation Meeting: Conduct meeting at Project site to comply with requirements of Division 1 Section "Project Meetings" and the following:
 - At least 30 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating Work, and availability of materials. Establish preliminary Work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for concrete design mixes.
 - c. Agency responsible for field quality control.
 - d. Ready-mix concrete producer.
 - e. Concrete subcontractor.

PART 2 - MATERIALS

2.01 FORM MATERIALS

- A. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one face.
- B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface and pop-out type grout plug cones.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 1064, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 1064, welded steel wire fabric.

- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type 1L.,
 - 1. Alternate types of Portland cement may be used when approved by the Engineer.
 - 2. Use one brand of cement throughout project unless otherwise approved by the Engineer.
- B. Fly Ash: No Fly Ash shall be used in concrete for this project.
- C. Normal-Weight Aggregates: ASTM C 33 and as specified.
 - 1. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when approved by the Engineer.
- D. Water: Potable.
- E. Admixtures, General: Provide concrete admixtures that contain no more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with all other admixtures.
 - 1. Subject to compliance with project requirements, products that may be used in the Work include, but are not limited to, the following:
 - a. Air-Tite, Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air, Euclid Chemical Co.
 - c. Darex AEA or Daravair, W.R. Grace & Co.
 - d. MB-VR or Micro-Air, Master Builders, Inc.
 - e. Sealtight AEA, W.R. Meadows, Inc.
 - f. Sika AER, Sika Corp.
- G. Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. PSI N, Cormix Construction Chemicals.
 - b. Eucon WR-75, Euclid Chemical Co.
 - c. WRDA, W.R. Grace & Co.
 - d. Pozzolith Normal or Polyheed, Master Builders, Inc.
 - e. Metco W.R., Metalcrete Industries.
 - f. Plastocrete 161, Sika Corp.
- H. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Super P, Anti-Hydro Co., Inc.
 - b. Concure 200, Cormix Construction Chemicals.
 - c. Eucon 37, Euclid Chemical Co.
 - d. WRDA 19 or Daracem, W.R. Grace & Co.
 - e. Master Rheobuild 1000, Master Builders, Inc.
 - f. Superslump, Metalcrete Industries.
 - g. Sikament 300, Sika Corp.
- I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Q-Set, Conspec Marketing & Manufacturing Co.
 - b. Lubricon NCA, W.R. Grace & Co.

- c. Accelguard 80, Euclid Chemical Co.
- d. Daraset, W.R. Grace & Co.
- e. MasterSet FP20, Master Builders, Inc.
- f. Accel-Set, Metalcrete Industries.
- J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. PSI-R Plus, Cormix Construction Chemicals.
 - b. Eucon Retarder 75, Euclid Chemical Co.
 - c. Daratard-17, W.R. Grace & Co.
 - d. Pozzolith R, Master Builders, Inc.
 - e. Plastiment, Sika Corporation.

2.04 RELATED MATERIALS

- A. Waterstops: 4" fuel resistant HDPE water stop with centerbulb such as JP Specialties, Inc. Model JP436 or approved equal.
- B. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type II, Class B. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. A-H 3 Way Sealer, Anti-Hydro Co., Inc.
 - b. Spartan-Cote, The Burke Co.
 - c. Conspec #1, Conspec Marketing & Mfg. Co.
 - d. Day-Chem Cure and Seal, Dayton Superior Corp.
 - e. Eucocure, Euclid Chemical Co.
 - f. Horn Clear Seal, Tamms Industries.
 - g. L&M Cure R, L&M Construction Chemicals, Inc.
 - h. Masterkure, Master Builders, Inc.
 - i. CS-309, W.R. Meadows, Inc.
 - j. Seal N Kure, Metalcrete Industries.
 - k. Kure-N-Seal, Sonneborn-Chemrex.
 - I. Stontop CS2, Stonhard, Inc.
- C. Bonding Agent: Polyvinyl acetate or acrylic base.
 - 1. Subject to compliance with project requirements, products that may be incorporated in the Work include, but are not limited to Acrylic or Styrene Butadiene as following:
 - a. Acrylic Bondcrete, The Burke Co.
 - b. Strongbond, Conspec Marketing and Mfg. Co.
 - c. Day-Chem Ad Bond, Dayton Superior Corp.
 - d. SBR Latex, Euclid Chemical Co.
 - e. Daraweld C, W.R. Grace & Co.
 - f. Hornweld, Tamms Industries
 - g. Everbond, L&M Construction Chemicals, Inc.
 - h. Acryl-Set, Master Builders Inc.
 - i. Intralok, W.R. Meadows, Inc.
 - j. Acrylpave, Metalcrete Industries.
 - k. Sonocrete, Sonneborn-Chemrex.
 - I. Stonlock LB2, Stonhard, Inc.
 - m. Strong Bond, Symons Corp.

2.05 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Engineer for preparing and reporting proposed mix

designs.

- B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed and approved by the Engineer.
- C. Design mixes to provide normal weight concrete with the following properties:
 - 1. Normal concrete design strength:
 - a. 5000-psi compressive strength at 28-days for valve vaults, trench drains, manholes and all other structures subject to possible aircraft loading.
 - b. 4500-psi compressive strength at 28-days for equipment pads and structures not subject to possible aircraft loading.
 - c. 4500-psi compressive strength at 28 days for curb, gutter, sidewalk and other similar unspecified concrete elements.
 - d. 2500-psi compressive strength at 28-days for mud slabs.
 - 2. Water-Cement Ratio: 0.45 maximum
 - 3. Air Entrainment: 5-7 % by volume
 - 4. Normal Concrete Slump: 3 ¹/₂ inches ± 1 inch.
 - 5. High Plasticity Concrete Slump: Concrete containing high-range water-reducing admixtures (superplasticizer) shall have a slump of not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete. High-range water-reducing admixtures may only be used for special applications with prior approval of engineer.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in Work.

2.06 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability and approved by engineer.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
- C. Use air-entraining admixture in exposed exterior concrete unless otherwise indicated. Add airentraining admixture at manufacturer's prescribed rate so concrete at point of placement has an entrained air content of 5-7 %.
- D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.07 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.08 CONCRETE WATERPROOFING ADDITIVE FOR CONTAINMENT STRUCTURES:

A. Fuel pits and vaults, containment basins, containment drain inlets, containment manholes, lift stations and other concrete structures, excluding dike walls, which will routinely be exposed to and/or intended to contain and/or convey fuel or fuel impacted storm water shall be constructed using concrete containing Xypex Admix C-1000 at the rate recommended by the manufacturer. Xypex additive shall also be used when containment and fuel structures are precast.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials and other related materials with placement of forms and reinforcing steel.

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3.02 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
 - 1. Provide Class A tolerances for concrete surfaces exposed to view.
 - 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb Work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, chamfers, blocking, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, recesses, and the like for easy removal.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate Work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing waterproofing during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Engineer.

- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete when indicated.
- E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.

3.05 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use placement drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Forms for Slabs: Set edge forms for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.06 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with inplace concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their Work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by handspading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation until completing placement of a panel or section.

- 1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
- 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- 3. Maintain reinforcing in proper position on chairs during concrete placement.
- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless specifically approved in writing by the Engineer.
- H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
 - Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated into total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 - 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.
 - 5. Coordinate with installation requirements for waterproofing panels.

3.08 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a smooth or rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. A rough-formed finish is defined as a concrete surface having texture imparted by the form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, such as waterproofing or dampproofing. This is a cast concrete surface obtained with selected formfacing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES

- A. Trowel Finish: Apply a trowel finish to interior monolithic slab surfaces where indicated on the plans.
 - After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor

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flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155.

- B. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete slabs.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiberbristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of Work by other trades, unless otherwise shown or directed, after Work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material in accordance with ACI hot weather requirements. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Use continuous water-fog spray.
 - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
 - Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
 - 1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.

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- B. Extend shoring from base slab to top slab unless otherwise permitted.
- C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support Work without excessive stress or deflection.
- D. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.13 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of walls and similar parts of the Work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location or members.

3.14 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Engineer.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Engineer.
- B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
- C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
 - 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Replace pavement with surface defects such as crazing, cracks that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

- 2. Correct high areas or low areas by removing and replacing the slab to the nearest joints shown on the plans.
- E. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs with prior approval of Engineer for method and procedure, using specified epoxy adhesive and mortar.
- G. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: All tests shall be performed by a qualified third party testing laboratory approved by the Owner, and retained and paid by the Owner.
- B. Sampling and testing for quality control during concrete placement may include the following, and as directed by Engineer.
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 2. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below; and when 80 deg F (27 deg C) and above, one test for each set of compressive-strength specimens.
 - 5. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - 6. Compressive-Strength Tests: ASTM C 39; Take one set of specimens for the first 25 cubic yards or less of each type of concrete placed each day. Take one additional set for each additional 50 cubic yards of concrete placed in the same day. Test one specimen at 7 days, two specimens tested at 28 days, and retain one specimen for later testing if required.
 - 7. When strength of field-cured cylinders is less than 85 percent of companion laboratorycured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 8. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to Engineer, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

PART 4 - MEASUREMENT

4.01 MEASUREMENT

- A. Unit of measure for Lump Sum Contract: Cubic yards of concrete acceptably placed and completed in compliance with this section.
- B. Unit of measure for Unit Price Contract: Cubic yards of structural concrete acceptably placed and completed in compliance with this section.

PART 5 - PAYMENT

5.01 PAYMENT

- A. Lump Sum Contract: Units of Work acceptably completed under this Section are subject to a Lump Sum contract and will not be measured separately for payment other than for purposes of progress payments.
- B. Unit Price Contract: Acceptably completed and approved items of Work constructed under this Section shall be paid for at the unit price up to a maximum total units not exceeding the total units stated in the Bid Form, plus units approved by any contract change orders. Units will be calculated and paid for based on the physical dimensions indicated on the contract drawings and documents for the Work completed. Increases due to lax construction tolerances, unapproved over excavation, intentional surplus material, ticket discrepancies or other reasons for actual or apparent material overruns shall not be cause for additional payment or increases in the total contract units to be paid.

END OF SECTION

SECTION 099713.00 FUEL SYSTEM COATINGS

PART 1 - GENERAL

1.01 SUMMARY:

- A. The work to be performed in this specification includes the cleaning, preparation, painting, coating, and identification of fuel system piping materials, fuel storage tanks, materials, equipment and components.
- B. The preparation and application for the system shall include both field and shop operations.
- C. The applicable methods and system identification to be used shall be as follows. Reference the data sheets included in this section for individual systems:

ltem	Surface	Application	System
Internal Coating of	Interior	Shop	1
Tanks, and			
Equipment			
External Coating	Exterior	Shop/Field	2
of Equipment, and			
Tanks (2 Coat			
System)			

1.02 RELATED SECTIONS:

- A. Section 013300 Compliance Submittals
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- E. Section 335243.15 Fuel System General Valves
- F. Section 335243.16 Aviation Fuel Control Valves
- G. Section 335243.28 Fuel System Filtration
- H. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES:

- A. American Society of Testing and Materials (ASTM):
 - 1. D4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages
 - 2. D4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - 3. D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
 - 4. E337 Standard Test Method for Measuring Humidity with a Psychrometer
- B. American Society of Mechanical Engineers (ASME):
 - 1. A13.1 Scheme for the Identification of Piping System
 - 2. Z53.1 Safety Color Code for Marking Physical hazards
- C. Energy Institute
 - 1. El Standard 1541 Performance Requirements for Protective Coating Systems Used in Aviation Fuel Storage Tanks and Piping
 - 2. El Standard 1542 Airport Equipment Marking for Fuel Identification
- D. Association for Materials Protection and Performance (AMPP)
 - 1. SPO 178 Design, Fabrication and Surface Finish Practices for Tanks and Vessels in Immersion Service

- 2. SPO 188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Surfaces
- 3. SP-1 Solvent Cleaning. Removes oil, grease, soil, and other substances. Used with other methods to remove rust, paint and mill scale.
- 4. SP-3 Power Tool Cleaning. Prepares steel surfaces by the use of non-power hand tools.
- 5. SP-5 White Metal Blast Cleaning. Removes all scale, rust, and foreign matter. Leaves surface gray-white uniform metallic color.
- 6. SP-6 Commercial Blast Cleaning. Two-thirds of every 9 square inches free of all visible residues, remainder only light discoloration.
- 7. SP-7 Brush-Off Blast Cleaning. Removes only loose material, remaining surface tight and abraded to give anchor.
- 8. SP-10 Near White Blast Cleaning. At least 95% of every 9 square inches shall be free of all visible residues.
- 9. SP-11 Power Tool Cleaning to Bare Metal.
- 10. PA-1 Shop, Field, and Maintenance Coating of Metals
- 11. PA-2 Dry Film Thickness Measurement with Magnetic Gauges
- E. National Fire Protection Association
 - 1. NFPA 407 Aircraft Fuel Servicing
 - 2. NFPA 704 Standard System for the Identification of the Fire Hazards of Materials for Emergency Response

1.04 SUBMITTALS:

- A. Submit as specified in Section 013300 Compliance Submittals.
- B. Product Data
 - 1. Technical Data Sheets including product manufacturer, name of coating, and number designation of coating, etc.
 - 2. Material safety data sheets
 - 3. Color charts for selection of paint color by the Owner.
 - 4. Catalog cuts and samples of the piping and equipment labels
- C. Shop Drawings
 - 1. Submit a drawing that clearly indicates the proposed location of piping labels.
- D. Instructions
 - 1. Method of application and the minimum and maximum dry film thickness of coating (per coat) to be applied.
- E. Quality Assurance
 - 1. Test Reports
 - a. Third party AMPP Certified testing agency and their graphical report indicating test locations and results.
 - 2. Certifications
 - a. Certification from the manufacturer that the unthinned maximum VOC content of the field applied coating products is below the maximum allowable for the project location.

1.05 QUALITY ASSURANCE:

- A. The coating applicator for field operations or for shop operations shall have a minimum of 5 years of experience in the Systems specified. The coating applicator shall certify in writing that he has previous experience applying all of the coating systems in this specification for which he is responsible.
- B. Compliance submittals and certification of experience shall be submitted to the Engineer prior to starting the work.
- C. The coating applicator shall provide a certificate of quality control procedures utilized during application of internal and external coatings. The certification shall include surface preparation, film thickness per coat, curing procedures, and holiday testing.

- D. The coating manufacturer shall certify that the internal pipe coating used in all fuel contact locations is compatible for a submersible use in Jet-A and AVGAS Fuel.
- E. All coatings shall be applied in strict accordance with the manufacturer's recommendations including environmental conditions, surface preparation, coating method and coverage, etc.
- F. Contractor shall ensure that all newly painted surfaces remain clean and are not contaminated by subsequent blasting and painting operations. Contractor shall clean and/or recoat surfaces deemed not acceptable due to product contamination at no cost to the Owner.
- G. Coating Inspection
 - 1. Contractor shall employ the services of a third party AMPP Certified testing agency to perform all QC requirements.
 - 2. Inspector shall inspect the surface preparation, perform all wet film and dry film thickness testing on all shop and field applied coatings. Contractor shall submit to the Engineer the proposed testing agency for approval.
 - 3. Inspector shall record ambient temperature, humidity, and surface temperature.
 - 4. Inspect dry film for holidays, runs and sags.
 - 5. Inspector shall complete a daily inspection report similar to the sample report at the end of this section.

PART 2 - MATERIALS

2.01 SYSTEM TABLES:

A. System tables for interior and exterior coatings are included within this specification to indicate the degree of preparation, methods of application, finish thickness, manufacturer names and product numbers. This specification addresses coatings for components and materials for the fuel systems.

2.02 IDENTIFICATION OF PIPING:

- A. The identification of fuel system piping shall be through a combination of pressure sensitive labels, bands and flow arrows. Pipe labels shall be as detailed.
- B. The materials shall be as manufactured by Gammon Technical Products, W.H. Brady, Seton Corp. or approved equal and shall conform to ASME A13.1.
- C. Legend designations for all fuels shall be in accordance with El 1542.
- D. Flow arrows shall be coordinated with pipe size conforming to ASME A13.1 and shall be of the same color code as stated in EI 1542 for the corresponding fuel.

2.03 IDENTIFICATION OF EQUIPMENT AND TANKS:

- A. Pressure sensitive labels or stenciling with paint shall be used for the identification of equipment. If paint is used, it shall conform to these specifications.
- B. Equipment to be identified shall be as follows:
 - 1. Filter vessels and sump separators 3 inches high in two locations. Identification shall include the number that corresponds to the P&ID and the control system screens. Filter vessels shall have a decal stating "Filter Change Due" with a space for filling in dates.
 - 2. Pumps 3 inches high in two locations. Identification shall include the number that corresponds to the P&ID and the control system screens.
- C. Tanks to be identified shall be as follows:
 - 1. Tanks shall have a decal stating "Tank Last Cleaned On" with a space for filling in dates. Decal shall be placed on the tank shell adjacent to the bottom of the stairs. Lettering shall be 1 inch (25 mm) high.
 - 2. Horizontal fuel storage tanks 4 inches high in four locations (one label per quadrant). Identification shall include the number that corresponds to the P&ID and the control system screens, product type and useable volume in gallons (litres). Example below.
 - 3. Tanks shall have a 4" high black lettering decal stating" FLAMMABLE" AND "NO SMOKING"

- 4. Tanks shall have a hazardous materials identification marker located on four sides in accordance with NFPA 704. Place label directly beneath JET-A, TANK NO. and AVGAS, TANK NO. Numbers shall be 3" high to be legible from 100 feet. Contractor shall coordinate with Owner and Fuel Provider to obtain correct NFPA 704 labeling.
- D. Provide identification tags with minimum 1/2" high lettering, corresponding to all valves and devices label indicated on the Contract Drawings. Secure tags to the components using a metal chain. Tags shall be made of stainless steel 1/32- inch thick with contrasting color for the engraved color. Locate tag so it is easily visible. Provide tags for the following equipment: Isolation and Control Valves, High Point Vents and Low Point Drains, Meters, Surge Absorbers, Control devices (flow switches, temperature transmitters, pressure transmitters, etc.), and Relief Valves.
- E. Valves color shall be as listed in system tables.

2.04 IDENTIFICATION OF OPERATIONS:

- A. This section of the specification addresses the identification of operational areas and operational conditions within the facility.
- B. Two color laminated fiberglass signs 1/4-inch thickness with contrasting color for the engraved color shall be used.
- C. The signs shall come complete with self-tapping metal screws for attachment.
- D. Lettering shall be 2-inch high Eurostile Bold Extended in white for U.S. Standard Red backgrounds.
- E. Signage shall identify the following:
 - 1. EMERGENCY FUEL SHUT-OFF (PUSH): Locate at each EFSO station. The method of operation for the "EMERGENCY FUEL SHUT-OFF" shall be indicated by an arrow or by the word "PUSH" or "PULL", as appropriate.
 - 2. JET-A FUEL
 - 3. JET-A BULK LOAD SKID: Locate on the front of skid.
 - 4. JET-A BULK UNLOAD SKID: Locate on the front of skid.
 - 5. AVGAS BULK LOAD SKID: Locate on the front of skid.
 - 6. AVGAS BULK UNLOAD SKID: Locate on the front of skid.
 - 7. 100LL AVGAS
 - 8. 100LL AVGAS VAPOR RECOVERY
 - 9. NO SMOKING

PART 3 - EXECUTION

3.01 INTERNAL COATING OF TANKS AND EQUIPMENT:

- A. Reference System 1 of the attached tables.
- B. This section shall apply to **shop** applied epoxy internal coatings for above ground tanks, components, exterior of piping and pipe supports that are installed internal to the tank, and equipment.
- C. All fuel contact surfaces shall receive the epoxy coating and shall be free of holidays according to AMPP SPO 188 Discontinuity (Holiday) inspection standard. Epoxy coating shall also be qualified to EI Standard 1541, Second Edition. AMPP inspector shall inspect 100% interior of tanks and 10% of interior of piping.
- D. Clean surfaces of new metal to be coated by removing rust, loose mill scale, welding slag, dirt, oil, grease, and other foreign substances. The surfaces to be painted shall be abrasive blasted immediately before applying the prime coat. Remove all surface irregularities such as burrs, weld splatter, etc., to Condition D of AMPP SPO 178 before proceeding with blasting. Blasting shall be in strict accordance with Society for Protective Coatings Surface Preparation Specification. Care shall be taken to prevent grease, oil or other organic matter (including boot marks and perspiration) from contacting the blasted surface prior to application of the prime coat. Blasting shall be coordinated with primer application, which shall be applied as soon as possible after blasting. If the blasted surface does not meet the specified standard prior to

primer application, it shall be re-blasted. If the blasted surface remains uncoated overnight, it shall be re-blasted. Remove all traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, by blowing with clean dry air, or by vacuum cleaning. Contractor assumes all risk by extending the primer application with the use of dehumidification.

- E. Coatings shall be a two (2) coat system of epoxy paint and be applied in accordance with the manufacturer's written instructions and SSPC PA-1. Paint shall be applied to the full internal and external length of pipe and fittings and equipment internal to the tank. The total dry film thickness of the paint shall be within the range recommended by the manufacturer. The ends of the pipe and fittings shall have the paint wiped back 2" with cloth or other approved absorbent material. Masking the ends will not be acceptable. The temperature of the blasted steel shall be a minimum of 5 degrees F (3 degrees C) above the dew point. Surface temperatures shall not be below 50 degrees F (10 degrees C) unless otherwise specified by manufacturer's data sheet and the relative humidity shall be no greater than 85 percent during coating application measured according to ASTM E-337. Provide heaters and dehumidification as required by conditions to maintain coating schedule.
- F. Dry film thickness shall be spot checked per SSPC PA-2 at a Restriction Level 3 on the coated surfaces after each coat has been applied and has cured. For internal pipe readings, a minimum of three spot checks shall be performed at each pipe end. Exterior pipe reading procedure shall follow SSPC PA-2 Appendix 7. If film thickness is not found to be uniform and to specification by the Inspector, the Contractor shall be required to apply additional coats at no cost to the Owner until the specified film thickness has been obtained. If the dry film thickness exceeds the maximum allowable film thickness per the manufacturer, the Contractor shall remove and reapply the coating in those areas at no cost to the Owner. Dry film thickness is to be checked by the Contractor at his expense by a third party AMPP certified coating inspector according to SSPC PA-2.
- G. After the paint has dried to its maximum hardness, the ends of all pipes are to be closed with plastic cap seals manufactured for this purpose. The aboveground tanks shall have the manways installed and all nozzles and flanges covered with plastic covers with the exception of the vent.
- H. If, in the opinion of the Engineer or AMPP inspector, the coatings show ridges, waves, runs, orange peeling, or holidays indicating uneven coverage or improper application, the Contractor shall be required to remove and re-apply the coating at no cost to the Owner.

3.02 EXTERNAL COATING OF ABOVE EQUIPMENT AND TANKS (2 COAT SYSTEM):

- A. Reference System 2 of the attached tables.
- B. All equipment which are installed above ground shall be given a protective covering applied with equipment especially designed for this purpose. Before the coating is applied, the surface of the pipe, fittings and equipment shall be thoroughly cleaned of all rust, scale, oil, grease and other matter that will interfere with the proper adhesion of the primer coat. Those pieces of equipment, valves, pumps, motors, actuators, etc that have been shop primed or delivered to the site with a finish coat shall be properly prepared for application of the coating. Contractor shall coordinate with the equipment suppliers and the coating manufacturer on the proper preparation and application of the coating. Provide certification from coating supplier that the systems are compatible.
- C. The surfaces to be painted shall be abrasive blasted immediately before applying the prime coat. Remove all surface irregularities such as burrs, weld splatter, etc., before proceeding with blasting. Blasting shall be in strict accordance with AMPP. Care shall be taken to prevent grease, oil or other organic matter from contacting the blasted surface prior to application of the prime coat. Blasting shall be coordinated with primer application, which shall be applied as soon as possible after blasting. If the blasted surface does not meet the specified standard prior to primer application, it shall be re-blasted. If the blasted surface remains uncoated overnight, it shall be reblasted. Remove all traces of blast products from surfaces, pockets and corners to

be painted by brushing with clean brushes, by blowing with clean dry air, or by vacuum cleaning.

- D. External welds shall be spot blasted to the original specified standard with a profile suitable to manufacturer's recommendation for product used. A stripe coat shall be applied on the second coat.
- E. All fieldwork shall be done in a manner and with materials that will produce a covering equal in effectiveness to that of the factory applied coating.
- F. Prepare the surface as specified, defined and remove any loose rust, scale, dust or dirt. Oil and grease are to be removed with suitable solvent. All field-applied coatings shall conform to the contour of the pipe or fitting leaving no moisture traps between or under the coating.
- G. ALL equipment labels, data plates, control tubing, pressure gauges, etc., shall be masked prior to painting adjacent piping. If these items are painted, the Contractor shall clean them to the satisfaction of the Owner or replace them at no cost to the Owner.
- H. Coatings shall be a two (2) coat system with an epoxy first coat and a polyurethane top coat applied in accordance with the manufacturer's written instructions and SSPC PA-1. The total dry film thickness of the paint shall be be within the range recommended by the manufacturer. The temperature of the blasted steel shall be a minimum of 5 degrees F (3 degrees C) above the dew point. Surface temperatures shall not be below 50 degrees F (10 degrees C) unless otherwise specified by manufacturer's data sheet and the relative humidity shall be no greater than 85 percent during coating application measured according to ASTM E-337. Provide heaters and dehumidification as required by conditions to maintain coating schedule. For those surfaces that are shop primed only and then erected with the tank, the recoat window time will have elapsed. Contractor shall brush blast the previously primed surfaces and apply an additional prime coat prior to the top coat.
- I. Dry film thickness shall be spot checked per SSPC PA-2 at a Restriction Level 3 on the coated surfaces after each coat has been applied and has cured. Pipe reading procedure shall follow SSPC PA-2 Appendix 7. If film thickness is not found to be uniform and to specification by the Inspector, the Contractor shall be required to apply additional coats at no cost to the Owner until the specified film thickness has been obtained. If the dry film thickness exceeds the maximum allowable film thickness per the manufacturer, the Contractor shall remove and reapply the coating in those areas at no cost to the Owner. Dry film thickness is to be checked by the Contractor at his expense by a third party AMPP certified coating inspector according to SSPC PA-2.
- J. If, in the opinion of the Engineer or AMPP inspector the coatings show ridges, waves, runs, orange peeling, or holidays indicating uneven coverage or improper application, the Contractor shall be required to remove and re-apply the coating at no cost to the Owner.

3.03 PIPING AND EQUIPMENT IDENTIFICATION:

- A. Clean area of surface to receive label or other pressure-sensitive item free of oil, grease, dust, dirt, or other substances that would affect adhesion.
- B. On painted surfaces, install label only after coating system is complete and dry film thickness testing completed and accepted.
- C. Use proper label type suitable for interior or exterior location as applicable.
- D. Locate labels on piping near connections to equipment, adjacent to valves or fittings, and at intervals not to exceed 25 feet (8 m). Final location shall be determined by Owner and Engineer.
- E. For piping with arrows to indicate direction of flow, place arrows adjacent to or below labels, depending upon visibility. For dual-flow piping, indicate both directions.
- F. Locate legends and labels so as to be visible from normal line of vision above finished floor or grade level.

3.04 PROTECTION:

- A. Cover and protect all surfaces that are not to be painted which are in close proximity to the painting operation. Remove all protective materials when appropriate and before materials such as masking tape becomes difficult to remove.
- B. Provide signs to indicate fresh paint areas.
- C. Mask, remove, or otherwise protect finish hardware, control tubing, pressure gauges, control devices, and equipment nameplates as necessary. Provide cover to prevent paints from entering orifices in electrical or mechanical equipment.
- D. Provide daily cleanup of both storage and working areas and removal of all paint refuse, trash, rags, thinners, etc. Dispose of leftover containers, thinners, rags, brushes, rollers, etc. in accordance with applicable regulations.

3.05 CLEANING:

- A. Touch up and restore damaged finishes to original condition as required. Remove all masking tape residue and glues that may be left on surfaces.
- B. Remove spilled, dripped or splattered paint from all surfaces.

3.06 COATING REPAIRS:

- A. Repair all damages to pipe coating systems before the piping is holiday tested. This includes all cuts, breaks, voids, bruised or scarred spots, or other damage caused prior to delivery, or resulting from handling or installation of the pipe, or from any cause whatsoever.
- B. Included also are damaged coatings where new connections are made to existing coated pipes or where existing coated pipes are uncovered or exposed for any reason.
- C. Also repair the coating where welds are made and where damaged or broken by the installation of instrumentation or other accessories or appurtenances.
- D. Repair all holidays detected during inspection of coatings. Use the same coatings for repair as was used for the base coating.

3.07 INSPECTION:

- A. Contractor shall employ the services of a third party AMPP certified coating inspector. Inspector shall provide daily reports of environmental conditions including ambient temperature, substrate temperature, relative humidity, and wind speed direction.
- B. Surface profile shall be tested using ASTM D4417 Replica tape. Ensure correct mil range tape is used. Include with daily reports.
- C. Prior to coating but post blasting, ensure all dust is removed. Use clear cellophane tape to determine the amount of dust from abrasive blasting and other sources has not been removed. Press the tape on the surface, peel off, and visually observe the amount of dust that sticks to the tape. Clean the test area with acetone or alcohol to remove tape adhesive from prepared surface. The test tape showing the dust particles shall be documented by applying it to the daily inspection report.
- D. Use wet film gauges to check each application per ISO 2808 at a maximum interval of 15 minutes in order to correct low or heavy film build immediately.
- E. Use dry film gauge to check each coat when dry, and the total system when completed.
- F. Use holiday or pinhole detector to detect and correct voids when indicated on system sheet according to AMPP SP0188.

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Project: Feature:				Date:			
Feature:				1			
	Feature:				Report By:		
Contract No:		Paint C	ontractor:				
SPECIFICATIONS	Tabulation No:		em to be C	Coated:	W_W_0_0_000_00_0		
Coating Category:	Total DFT (min.):	mils	Tab Surface	Prep. Method:		
<u>Coat No.</u> <u>Mat</u> Primer: Intermediate: Topcoat:	erial Manufacturer	Ŧ	Pro	duct Name	DFT Range		
WEATHER R	eading Time:						
 Substrate Temperature Ambient (Dry Bulb) Tem F): Wet Bulb Temperature (Relative Humidity (peror Dew Point Temperature Item (1) minus (2) (in de Wind (mph) and Director 	(degrees F): p. (degrees degrees F): intage): (degrees F): grees F): on:						
Comments: SURFACE PREPARATIO	N Surface Pre	paration	Method	SSPC-S	P / NACE No		
Abrasives: Manufacture Contaminants (ASTM D 49 Chloride Specific Ion: Compressor Air: Ty	Used: r H40): Fines Test Method U	_ Prod _yes / sed	luct Name: no; Oil CFM	yes / no; pH Passes ASTI	Class A, Type : Conductivity _: Results MD 4285:yes / no		

	COATING D	AILY INSPECTION	N REPOR	RT		2 of 2
APPLICATION AN	D MATERIALS					
Manufacturer	Product Name	Batch Number	Gal	Color	Thinner_	
					Product	<u>Gal/Oz %</u>
Environmental Con	trol: Heaters ye	s/ no; Dehum	idification	n yes / _	no, Unit Si	29
Material Mixing: Po	ower Mixing Time	minutes; Induc	tion Time	eyes / _	no,	minutes
Stripe Coats Applie	:yes / no;	Method:	Bush/Ro	ller Spr	ay	
Application Method	l: Brush; Ro	ller; Airless;	Conve	intional;	Plural;Ek	ectrostatic
Applied Within Rec	coat Window: Primer	yes/no; Inte	mediate	yes/	no; Topcoat _	yes / no
Wet Film Thicknes	s (WFT): Primer	mils: Intermed	sate	mils; To	pcoat	mils
Comments:						
TESTING OF HAR	DENED COATING					
Dry Film Thickness Area Inspected: Number of 5 Spot I Average of 5 Spot	: (DFT) by SSPC-SP _ less than 300 ff?; Measurement Group Measurement Group	PA2: less than 1.000 s Taken Within Abo s mils; C4) ft ² ; ove Inspe onform to	equal to or g acted Area: _	preater than 1, at onsyes /	000 ft² _ 100 ft² areas no
Discontinuity (Holic	day) Testing by NACE	E RP 0188				
Tester Used:	Low Voltage (Sp	onge)	-	High Volt	lage	
Set at vol	ts: Number of D	efects Found	; De	fects Repair	red yes7	0
Comments:						

3.08 COATING TABLES

FUEL SYSTEM COATINGS SYSTEM - 1

SERVICE: Internal Coating of Tanks, and Equipment

Surface Preparation: SSPC-SP 10 to a profile depth recommended by product manufacturer.

First Coat: Multi-purpose, jet-fuel resistant, epoxy coating. Apply at a rate to meet the manufacturer's recommended dry film thickness. Do not exceed the maximum dry film thickness as published by the manufacturer. Wipe coating 2" from end of pipe.

Second Coat: Same as first coat except color shall be different that first coat to distinguish between coats. Second coat shall be white, light gray, or beige for light reflectance and to facilitate inspection. Wipe coating 2" from end of pipe.

Third Coat: Not required.

System Total: System total shall meet the recommended dry film thickness.

Volatile Organic Content: Shall meet all state and local regulations.

Manufacturer	First Coat	Touch Up	Second Coat	Third Coat
International	Interline 850	N/A	Interline 850	N/A
Paint LLC.				
Tnemec	Tneme-Liner	N/A	Tneme-Liner	N/A
	Series 61		Series 61	
US Coatings	GripLine 6520	N/A	GripLine 6520	N/A

Notes:

1. Upon completion, check for voids with a suitable electric holiday detection operating at the proper voltage as recommended by the manufacturer. Repair all holidays.

2. Internal valves, stainless steel valves, piping, fittings, etc. shall not be coated.

FUEL SYSTEM COATINGS SYSTEM - 2

<u>SERVICE</u>: External Coating of Above Ground Equipment, and Tanks (2 Coat System)

Surface Preparation: SSPC-SP 6 to a profile depth recommended by product manufacturer.

First Coat: High build, high solids epoxy. Apply at a rate to meet the manufacturer's recommended dry film thickness. Do not exceed the maximum dry film thickness as published by the manufacturer.

Second Coat: High build, high solids polyurethane. Gloss shall be no greater than 35 gloss units (measured at an angle of 60 degrees). Apply at a rate to meet the manufacturer's recommended dry film thickness. Do not exceed the maximum dry film thickness as published by the manufacturer.

Third Coat: Not required.

System Total: System total shall meet the recommended dry film thickness.

Volatile Organic Content: Shall meet all state and local regulations.

Manufacturer	First Coat	Touch Up	Second Coat	Third Coat
PPG	Amercoat 385	Same as first	Pitthane Ultra	N/A
		coat	LS	
Tnemec	Series V69	Same as first	1095 Endura-	N/A
		coat	Shield	
International	Intergard 251	Same as first	White Colors:	N/A
Paint LLC.	HS	coat	Interthane	
			879UHS	
			Non-White	
			Colors:	
			Interfine 979	

Notes:

1. Gloss will not be acceptable.

2. Top color shall be white for all piping, equipment, and tanks. For all carbon steel manual (butterfly, ball, check, plug, etc.) and control valves, the top color shall be black for Jet-A service and shall be royal blue for Avgas service per El 1542, red for unleaded and green for diesel. Fire pipe shall be red.

3. Stainless steel valves, piping, fittings, etc. shall not be coated. All electrical equipment and conduit shall not be coated.

END OF SECTION

SECTION 260500 ELECTRICAL GENERAL

PART 1 - GENERAL

1.01 SUMMARY

- A. The general provisions of the contract outlined in Divisions 00 and 01 apply to work included in this specification.
- B. This division of the Specifications, Division 26, covers the complete exterior electrical systems as indicated on the drawing or as specified herein. Provide all materials, labor, equipment and supervision to install electrical systems.

1.02 RELATED SECTIONS

- A. Division 26 Electrical Work
- B. Section 33 52 43.00 Fuel System General Provisions
- C. Section 33 71 19 Electrical Underground Ducts, Ductbanks and Manholes
- D. 40 60 00 Fuel System Controls
- E. 40 70 00 0 Fuel System Instrumentation

1.03 REFERENCES

- A. All electrical work shall be in accordance with the following codes and regulations. Except where a specific date is given in the general conditions, specific conditions or herein, the issue in effect (including amendments, addenda, revisions, and supplements) on the date of the contract, shall apply.
 - 1. The National Electrical Code (NFPA 70)
 - 2. The National Electrical Safety Code (A.N.S.I. C2)
 - 3. The Life Safety Code (NFPA 101)
 - 4. Municipal ordinances governing electrical work
 - 5. Applicable local Building Codes.
- B. Material Standards All material shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed below are applicable to materials specified herein.
 - 1. American society for Testing and Materials (A.S.T.M.)
 - 2. Underwriter's Laboratories, Inc. (U.L.)
 - 3. National Electrical Manufacturer Association (N.E.M.A.)
 - 4. Insulated Cable Engineers Association (I.C.E.A.)
 - 5. Institute of Electrical and Electronic Engineers (I.E.E.E.)
 - 6. National Fire Protection Association (N.F.P.A.)
 - 7. American National Standards Institute (A.N.S.I.)

1.04 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. Refer to the individual sections for identified equipment and material for which submittals are required. Do not submit on equipment or materials not requested in the specifications.
- C. Refer to the Conditions of the Contract and General Requirements for record (as-built) drawings.
- D. Product Data
 - 1. Submit product data of all equipment and materials specified to be submitted in the product data section of each individual specification.
- E. Shop Drawings
 - 1. Submit shop drawings of all equipment and materials specified to be submitted in the shop drawings section of the specification.
 - 2. Records Drawings(As-Builts)
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- a. Provide and keep up to date a complete set of record (as-built) prints, which shall be corrected regularly to show electrical changes from original set of Contract Drawings, including Addenda, Modifications, Change Orders, field order, job decisions, etc. Project record set shall be kept as Record Drawings. Drawings to be dimensioned.
- b. Record documents shall in accordance with Division 1 requirements of this specification.
- F. Instructions
 - 1. Obtain all permits and inspections for the installation of this work and pay all charges incident there to. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.
 - 2. The Contractor shall provide written notice of any deviations from the requirements of the contract or construction documents that he proposes to undertake. The Contractor remains liable for any deviations unless reviewed and written acknowledgment is received from the Engineer.
- G. Closeout Submittals
 - 1. Warranty
 - a. For warranty of work under Division 26, Division 33 and Division 40 refer to the Conditions of the Contract and Division 1.

1.05 DRAWINGS

- A. The drawings indicate the arrangement of electrical equipment. Coordinate installation of electrical equipment with structural system and mechanical equipment and access there to.
- B. Do not scale drawings. Obtain dimensions for layout of equipment from Civil, Mechanical or Architectural plans unless indicated on Electrical plans.
- C. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the Engineer.
- D. Equipment layout is based on one manufacturer's product. Where equipment is selected by the Contractor for use on the job differs from layout, the Contractor shall be responsible for coordinating space requirements and connection arrangements.

1.06 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Operation and Maintenance manuals shall be in accordance with Section 013300 Compliance Submittals and Section 017800 Close-Out Submittals.
- B. Prior to the final inspection and at a time designated by the Owner's Representative, the services of a competent representative shall be provided by the Contractor to instruct Using Agency in the operation and maintenance of each of the systems specified herein.
 1. Fuel System Controls
 - 2. Emergency Fuel Shutoff System

1.07 EQUIPMENT REQUIRING ELECTRICAL SERVICE

- A. Review all specification sections and drawings including fuel systems and mechanical drawings, Division 33 and Division 40 of the specifications for equipment requiring electrical service.
- B. Drawings indicate design loads and voltages and corresponding control equipment and feeders. If equipment furnished differs with those indicated on the drawings or specified herein, over current protection, control equipment and circuits shall be adjusted in size accordingly at no additional cost to Owner.
- C. When motor size provided differs from size indicated or specified, make adjustments to wiring, conduit, disconnecting means and branch circuit protection to accommodate equipment actually provided without incurring additions to the contract price.
- D. The products of specific manufacturers have been used as the basis of design. Any changes to the structure, piping, controls, electrical wiring, conduit, disconnecting means and branch circuit protection that result from the use of other manufacturers shall be coordinated with all other trades by the contractor and approved in writing on letterhead by the Engineer before the

odering of the equipment from the manufacturer. Any resultant modifications required shall be performed by the Contractor without incurring additions to the contract price.

- E. For all industrial control panels as defined by Article 100 and Article 409 of the NEC, determine the short circuit current ratings (SCCRs) in accordance with UL 508A. All industrial control panels shall be labeled with their SCCR in accordance with NEC Article 509 and UL 508A. Submit, with all equipment product data, each applicable equipment item's SCCR.
- F. The contractor shall compare the SCCRs of all equipment furnished, including industrial control panels, to the available fault current as indicated in the contract documents. If the contract documents require a contractor's study to determine available short circuit currents, the contractor shall compare the SCCRs of all equipment furnished, including industrial control panels. The contractor must ensure, through these comparisons, that SCCRs of equipment, including industrial control panels, are not exceeded and provide all equipment necessary to protect all equipment and industrial control panels, to include but not limited to appropriately rated fused disconnects with appropriately sized current limiting fuses without incurring additions to the contract price.

1.08 MECHANICAL SYSTEMS INTERFACE

- A. Control wiring and control equipment specified in Division 26, Division 33 and Division 40 sections and shown on the drawings shall be included in this Division. Refer to Division 40 for sequence of operation. Also, refer to the individual sections for work specified elsewhere of related sections.
- B. Motor controllers shall be furnished and installed under Division 26, unless specified to be furnished as an integral component of the equipment. Provide the number and type of auxiliary contacts necessary to interlock the equipment and provide the specified control sequence.
- C. Power wiring to all motors and motor controllers and between motors and controllers shall be provided in Division 26.
- D. Where drawings indicate or where specified, equipment to be controlled by line voltage interlock or device, provide line voltage control wiring in Division 26.

1.09 SCHEDULING OF OUTAGES

- A. Electrical work requiring interruption of electrical power shall be done at the time other than normal working hours unless approved by owner.
- B. Schedule all work requiring interruption of electrical power two weeks prior to actual shut down. Submit schedule in writing indicating extent of system to be de-energized, date and time when power is intended to be interrupted, and date and time power will be restored.
- C. Schedule shall be subject to the approval of the Engineer and the Representative of the Owner.

1.10 SITE INVESTIGATION

A. Prior to submitting bids of the project, visit the site of the work to become aware of existing conditions which may affect the cost of the project. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems, shall be restored to their original condition before the completion of this project.

PART 2 - MATERIALS

2.01 GENERAL

- A. All material shall be new.
- B. Furnish all materials specified herein or indicated on the drawings.
- C. Materials of the same type shall be the product of one manufacturer.
- D. U.L. list material shall be U.L. label.

2.02 SPARE PARTS AND ATTIC STOCK

A. Prior to the final inspection and at the time designated by the Engineer, turn over to the Owner spare parts or attic stock, unless otherwise listed in the individual specification sections,

consisting of the following materials in the quantity specified:

- 1. Greater of 5% or 3 spare fuses of each type and each size within each type as used on the project.
- 2. Greater of 5% or 3 spare bulbs of each type and each size within each type as used on the project.
- 3. One spare air filter for each control panel or electrical enclosure as used on the project.
- 4. Greater of 5% or 2 spare lens covers for each control panel indicator as used on the project.
- 5. Greater of 5% or 2 spare patch cords for each type as used on the project.
- 6. Recommended spare parts per manufacturer's installation guide.
- B. Materials shall be new, in the original packing, of the same manufacturer and type as installed on the project and comply with these specifications receive receipt for all materials turned over to Owner.

PART 3 - EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, HANDLING AND PROTECTION

- A. Refer to the general requirements section of the specifications, Division 1, for storage, protection, and handling requirements.
- B. Inspect material upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material.
- C. Provide trailers or shed for storage of materials, equipment, tools, etc., requiring such a facility. Areas for general storage trailers or sheds shall be provided by Contractor.
- D. Provide dry, weathertight place for storing materials requiring protection from weather.
- E. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact.
- F. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in manner to prevent damage to materials during storage and handling. Replace damaged materials.
- G. Containers which are broken, opened, watermarked, or otherwise damaged materials are unacceptable and shall be removed from premises.
- H. Provide protection against direct sunlight, rain, snow, wind, ice, or heat for suitable storage of materials or equipment delivered to site to be incorporated into Project.
- I. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.02 CLEANING AND PAINTING

- A. Remove, oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touchup scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, or equipment enclosure with paint furnished by the equipment manufacturers specifically for that purpose.
- B. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinets unless required by the Architect. Remove trim covers before painting. Under no conditions shall locks, latches of exposed trim clamps be painted.
- C. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the "painting", Section of these Specifications.
- D. Where plywood backboards are used to mount equipment provided under Division 26, 33, and 40, paint backboards with two coats of light grey semi-gloss paint under Division 09.
- E. Paint exterior, exposed conduit, conduit supports and hardware to match surroundings.

- F. Paint all rack structures in color matching surroundings, or, if no exterior wall, tank or piping to match, paint rack support structures dark gray color.
- G. Painting shall be in accordance with Division 09 of these specifications.

3.03 EQUIPMENT CONNECTIONS

- A. Connect all equipment requiring electrical connections under Division, 26, 33 and 40 of these specifications. Where electrical connections to equipment require specific locations, obtain locations from shop drawings. Do not scale drawings for location of conduit stud-ups or boxes mounted in wall or floor to serve specific equipment.
- B. Electrical circuits to equipment furnished under other divisions of these specifications are based on design loads. If actual equipment furnished has loads other than design loads, revise electrical circuits and protective devices to be compatible with equipment furnished and in compliance with the National Electrical Code at no additional cost to the Owner.
- C. The Contractor's attention is directed to other divisions of these specifications, where equipment requiring electrical service is specified, to become aware of the scope of work under this division of these specifications requiring electrical service and connections to equipment specified elsewhere.

3.04 ELECTRICAL SYSTEMS, OPERATIONAL TESTS, MANUFACTURERS SYSTEMS CERTIFICATION AND DESIGN AUTHORITY ASSISTANCE

- A. Testing
 - 1. Refer to the individual specification sections for test requirements.
 - 2. Prior to the final inspection, the systems or equipment shall be tested and reported as herein specified. Submit test reports to the Owner's Representative for approval.
 - 3. All electrical systems shall be tested for compliance with the specifications.
- B. Manufacturers' Certifications
 - 1. The electrical systems specified herein shall be reviewed for compliance with these specifications, installation in accordance with the manufacturer's recommendations and system operation by a representative of the manufacturer. The manufacturer shall submit certification that the recommendations and is operating in accordance with the specifications.
 - 2. Provide manufacturers certification for the following systems:
 - a. Fuel System Instrumentation and Control System (Including Emergency Fuel Shutoff System)
- C. Design Authority Assistance
 - 1. The Contractor shall provide personnel to assist the Owner's Representative during all construction review visits. The Contractor shall provide all necessary tools and equipment to demonstrate the system operation and provide access to equipment, including screwdrivers, wrenches, ladders, flashlights, circuit testing devices, meters, keys, lifts, vehicles, etc.
 - 2. Remove equipment covers (i.e. panelboard trims, motor controls, device plates, and junction box covers) as directed for inspection of internal wiring.
 - 3. Energize and de-energize circuits and equipment as directed. Demonstrate operation of equipment as directed by the representative.
 - 4. The Contractor shall provide authorized representatives of the manufacturers to demonstrate to the Engineer compliance with the specifications of their respective system during or prior to the final inspection at a time designated by the Engineer. Refer to the specific specification section for additional testing requirements for demonstrations:
 - a. Fuel Instrument and Control System (Including Emergency Fuel Shutoff System)

END OF SECTION

SECTION 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

- A. Single conductor building wire.
- B. Power and control tray cable.
- C. Fire rated cable.
- D. Serial communications cable.
- E. Instrumentation communications cable.
- F. Wiring connectors.
- G. Electrical tape.
- H. Heat shrink tubing.
- I. Oxide inhibiting compound.
- J. Wire pulling lubricant.
- K. Cable ties.

1.02 RELATED SECTIONS

- A. Section 260526 Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- B. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- C. Section 310000.00 Site Preparation and Earthwork for Fueling:Trenching, excavating, bedding, and backfilling.

1.03 REFERENCES

- A. ASTM B3 Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM D3005 Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- E. ASTM D4388 Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2020.
- F. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- G. NECA 120 Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.
- H. NEMA WC 70 Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- I. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- J. NFPA 101 Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 83 Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

- N. UL 486A-486B Wire Connectors Current Edition, Including All Revisions.
- O. UL 486C Splicing Wire Connectors Current Edition, Including All Revisions.
- P. UL 486D Sealed Wire Connector Systems Current Edition, Including All Revisions.
- Q. UL 493 Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables Current Edition, Including All Revisions.
- R. UL 510 Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 260500 Electrical General, for submittal requirements.
- B. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
 - a. Single conductor building wire.
 - b. Instrumentation communications cable.
 - c. Wiring connectors each type.
 - d. Electrical tape each type.
 - e. Oxide inhibiting compound.
 - 2. Wire pulling lubricant.
- C. Quality Assurance
 - 1. Test Reports
 - a. Contractor's Field Quality Test Reports
 - 1) Contractor's Cable Tests
- D. Closeout Submittals
- E. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 013300 Compliance Submittals, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.

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- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 260526.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral/Grounded: White.
 - d. Equipment Ground, All Systems: Green.
 - e. Isolated Ground, All Systems: Green with yellow stripe.
 - f. Travelers for 3-Way and 4-Way Switching: Pink.
 - g. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - h. For control circuits, comply with manufacturer's recommended color code.

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i. Conductors 10 AWG and smaller shall have solid color insulation for the entire length of the conductor. Conductors 8 AWG and larger shall have solid color insulation or colored phase tape. Where applicable, phase tape shall be installed at all termination points and be visible and accessible.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures .
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN-2 or XHHW-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 SERVICE ENTRANCE CABLE

- A. Manufacturers:
 - 1. Copper Service Entrance Cable:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

2.05 INSTRUMENTATION COMMUNICATIONS CABLE

- A. Applications: Analog instrumenation.
- B. Type: UL Type TC multiconductor tray cable meeting UL1665 and IEEE 1202 flame tests.
- C. Sunlight resistant.
- D. Conductor: (2) #16 AWG (or AWG as indicated on the contract drawings), unshielded stranded copper twisted pairs.
- E. Insulation: PVC/Nylon, 600V RMS.
- F. Ground: outer shield (aluminum foil-polyestor tape) with #16 AWG copper drain wire.
- G. Jacket: PVC.
- H. Manufacturer:
 - 1. Beldon
 - 2. Alpha.
 - 3. Anixter.

2.06 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526 Grounding and Bonding for Electrical Systems.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads for motors 25 HP and above, in order to facilitate disconnection.
 - 5. Copper ConductorsSize 6 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 - 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- G. Push-in Wire Connectors: Rated 600 V, 221 degrees F (105 degrees C).
 - 1. Manufacturers:
 - a. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - b. NSI Industries LLC: www.nsiindustries.com/#sle.
 - c. Wago Corporation: www.wago.us/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Ilsco: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Approved euqal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

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- I. Compression Connectors: Provide circumferential type or hex type crimp configuration. 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Ilsco: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Ilsco: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

2.07 WIRING ACCESSORIES

- A. Electrical Tape:
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
 - c. Scotch Vinyl Color Coding Electrical Tape 35 or approved equal.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - a. Product: Scotch Vinyl Color Coding Electrical Tape 35 or approved equal.
 - b. Substituions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - a. Product: 3M Scotch Super 33+ Vinyl Electrical Tape or approved equal.
 - b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 - a. Product: 3M Scotch Rubber Splicing Tape 23 or approved equal.
 - b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 - a. Product: 3M Scotchfil Electrical Insulation Putty or approved equal.
 - b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18

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mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

- a. Product: 3M Scotch Varnished Cambric Tape 2510 or approved equal..
- b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- 7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, allweather vinyl backing; minimum thickness of 90 mil (2.3 mm).
 - a. Product: 3M Scotch Mastic Tape 2228 or approved equal.
 - b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Burndy LLC: www.burndy.com.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Ideal Industries, Inc.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. Approved equal.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. American Polywater Corporation: www.polywater.com/#sle.
 - c. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- E. Cable Ties: Material and tensile strength rating suitable for application.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Approved equal.
 - c. Substitutions: See Section 260500 Electrical General and 012500 Substitution Procedures.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

3.02 EXAMINATION

- A. Verify that interior of panelboards have been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

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- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.03 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.04 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, intrinsically safe and power-limited circuits in accordance with NFPA 70.
 - 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - a. Increase size of conductors as required to account for ampacity derating.
 - b. Size raceways, boxes, etc. to accommodate conductors.
 - 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
 - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
 - b. Branch circuits fed from feed-through protection of GFI receptacles.
 - c. Branch circuits with isolated grounding conductor.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Design Professional of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- E. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Design Professional and obtain direction before proceeding with work.
- F. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
- J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters. Splices are not allowed below grade unless prior written authorization has been granted by the Design Professional.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Identify conductors and cables in accordance with Section 260553 Identification for Electrical Systems.
- S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

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- T. Conductors shall be tested to be continuous and free of short circuits, damaged insulation and around faults. Conductors shall be tested to be continuous and free of short circuits and grounds prior to any terminations, or splicing to tested cables. Contractor shall provide the Design Professional a spreadsheet listing each conductor in each conduit and its resistance to adjacent conductors in the same conduit as well as the conduit itself. The same spreadsheet shall list the results of each conductors Megometer test. The Megger test shall be conducted based on cable manufactures settings, or a maximum of 500V for 300V insulated cable, whichever is less. The Megger test shall be conducted based on cable manufactures settings, or a maximum of 1000V for 600V insulated cable, whichever is less. The Engineer shall then approve the wiring at which point the Contractor shall be approved to terminate, splice or seal the conduit and install the re-enterable compound (if applicable). If The Engineer does not approve the conductor test, the Contractor shall replace the conductor at no additional cost to the project. If the Contractor seals the conduit prior to approval and it is shown that there is an issue in the cabling, the Contractor shall replace the cabling, and reimburse for any project costs expended by The Engineer in site visits, or inspections and any other delayed Contractors with no additional cost to the project. Insuring that the wire is properly installed and tested is critical to the project operation.
 - 1. Shorts shall be defined as any two points with approximately 250 ohms or less resistance between them.
 - 2. Opens on any one conductor shall be defined as having more than approximately 100 ohms resistance between the two test points.
 - 3. Megometer readings shall be considered failed if the readings do not read approximately 25 megaohms or greater for 300V cable, 100 Mohm or greater for 600V cable.

3.05 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.
- E. Ground access wells.

1.02 RELATED SECTIONS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
 1. Includes oxide inhibiting compound.
- B. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- C. Section 265600 Exterior Lighting: Additional grounding and bonding requirements for polemounted luminaires.

1.03 REFERENCES

- A. IEEE 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2017.
- D. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 260500 Electrical General, for submittals procedures.
- B. See Section 013300 Compliance Submittals, for submittal procedures.
- C. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
 - a. Conductors for grounding and bonding.
 - b. Connectors for grounding and bonding each type.
 - c. Ground rod electrodes.
 - d. Ground access wells.
- D. Quality Assurance
 - 1. Test Reports
 - a. System Ground Resistance Test
- E. Closeout Submittals
 - 1. Warranty
- F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

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- B. Manufacturer Qualifications
 - 1. Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 5, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 3. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor size as indicated but not less than #1/0 in direct contact with earth, installed at a depth of not less than 30 inches (750 mm).
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches (600 mm) outside building perimeter foundation.
 - c. Provide connection from ground ring conductor to:
 - 1) Ground rod electrodes located as indicated.
 - 2) Equipment as indicated on drawings.
 - 3) Ground Rod Electrode(s):
 - (a) Provide number of electrodes as indicated. When number of electrodes is not indicated, provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - (b) Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.

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- (c) Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area. (d) Provide ground access well where indicated.
- Provide additional ground electrode(s) as required to achieve specified 4) grounding electrode system resistance.
- G. Service-Supplied System Grounding:
 - For each service disconnect, provide grounding electrode conductor to connect neutral 1 (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 - For each service disconnect, provide main bonding jumper to connect neutral (grounded) 2. bus to equipment around bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Bonding and Equipment Grounding:
 - Provide bonding for equipment grounding conductors, equipment ground busses, metallic 1. equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Ground all non-current carrying parts of the electrical system, i.e. raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults.
 - Provide insulated equipment grounding conductor in each feeder and branch circuit 3. raceway. Do not use raceways as sole equipment grounding conductor.
 - Where circuit conductor sizes are increased for voltage drop, increase size of equipment 4. grounding conductor proportionally in accordance with NFPA 70.
 - Unless otherwise indicated, connect wiring device grounding terminal to branch circuit 5. equipment grounding conductor and to outlet box with bonding jumper.
 - Terminate branch circuit equipment grounding conductors on solidly bonded equipment 6. ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - Provide bonding jumper across expansion or expansion/deflection fittings provided to 7. accommodate conduit movement.
 - 8. Provide bonding for exterior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - Metal process piping. a.
- Pole-Mounted Luminaires: Also comply with Section 265600.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - Provide products listed and labeled as complying with UL 467 where applicable. 2.
- Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526: Β.
 - Use insulated copper conductors unless otherwise indicated. 1
 - а Exceptions:
 - Use bare copper conductors where installed underground in direct contact with 1) earth
 - Use bare copper conductors where directly encased in concrete (not in 2) racewav).
 - Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size 2 braided cables to provide equivalent gage of specified conductors.
- C. Connectors for Grounding and Bonding:

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- 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
- 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
- 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame, tanks and as indicated.
- 4. Manufacturers Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Burndy LLC: www.burndy.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- 5. Manufacturers Exothermic Welded Connections:
 - a. Burndy LLC: www.burndy.com.
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com.
 - c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- D. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
 - 4. Where rod lengths of greater than 10 feet (3.0 m) are indicated or otherwise required, sectionalized ground rods may be used.
 - 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Galvan Industries, Inc: www.galvanelectrical.com.
 - d. Harger Lightning & Grounding: www.harger.com.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- E. Ground Access Wells:
 - 1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 - a. Areas Exposed to Vehicular Traffic: Rated for not less than 20,000 pounds (89 kN) vertical design load.
 - 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 12 inches (300 mm) in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches (300 by 300 mm).
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches (250 mm).
 - 4. Cover: Factory-identified by permanent means with word "GROUND".
 - 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Harger Lightning & Grounding: www.harger.com.

d. Substitutions: See Section 260500 - Electrical General and Section 012500 - Substitution Procedures.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

3.02 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- D. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
- E. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- F. Identify grounding and bonding system components in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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SECTION 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED SECTIONS

- A. Section 033000.00 Cast-In-Place Concrete for Fueling: Concrete equipment pads.
- B. Section 260533.13 Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 260533.16 Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 265600 Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCES

- A. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 Metal Framing Standards Publication 2004.
- E. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 5B Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 260500 Electrical General, for submittal requirements.
- B. See Section 013300 Compliance Submittals, for submittal requirements.
- C. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for the equipment below:
 - a. Channel (Strut) Framing Systems
 - b. Post-Installed Concrete and Masonry Anchors
 - c. Quality Assurance
 - d. Closeout Submittals
 - 1) Warranty

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 5 times the applied force. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Approved equal.
 - f. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 - 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

- c. Approved equal.
- 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
- 5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 1-5/8 inch (41 mm) height.
- 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
 - d. Approved equal.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - f. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Busway Supports: 1/2 inch (13 mm) diameter.
 - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
 - f. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - g. Luminaires: 1/4 inch (6 mm) diameter.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. Wood: Use wood screws.
 - 9. Plastic and lead anchors are not permitted.
 - 10. Hammer-driven anchors and fasteners are permitted only as follows:
 - a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
 - b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
 - 11. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 - 12. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
 - 13. Manufacturers Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures .

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PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

3.02 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- D. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.00.
- E. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- F. Provide independent support from building structure. Do not provide support from piping (unless indicated otherwise), ductwork, or other systems.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 3. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.00.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 260533.13.
- J. Box Support and Attachment: Also comply with Section 260533.16.
- K. Exterior Luminaire Support and Attachment: Also comply with Section 265600.
- L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- M. Secure fasteners according to manufacturer's recommended torque settings.
- N. Remove temporary supports.

3.04 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

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- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13 CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Galvanized steel rigid metal conduit (RMC).
- B. PVC-coated galvanized steel rigid metal conduit (RMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Rigid polyvinyl chloride (PVC) conduit.
- E. Conduit fittings.
- F. Accessories.

1.02 RELATED SECTIONS

- A. Section 033000 Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC/MC-HL).
- C. Section 260526 Grounding and Bonding for Electrical Systems.
 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 260529 Hangers and Supports for Electrical Systems.
- E. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- F. Section 262100 Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- G. Section 310000.00 Site Preparation and Earthwork for Fueling: Excavating, bedding, and backfilling.

1.03 REFERENCES

- A. ANSI C80.1 American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. ANSI C80.6 American National Standard for Electrical Intermediate Metal Conduit 2018.
- D. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 101 Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- F. NECA 111 Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- G. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NEMA RN 1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit 2018.
- I. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- J. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- K. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 Flexible Metal Conduit Current Edition, Including All Revisions.
- M. UL 467 Grounding and Bonding Equipment Current Edition, Including All Revisions.
- N. UL 6 Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- O. UL 360 Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- P. UL 514B Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

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- Q. UL 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- R. UL 797 Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- S. UL 1203 Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.
- T. UL 1242 Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See section 260500 Electrical General, for submittal requirements.
- B. See section 013300 Compliance Submittals, for submittal requirements.
- C. Product Data
 - 1. Conduits & Fittings
 - a. Provide manufacturer's standard catalog pages and data sheets.
- D. Closeout Submittals
 - 1. Warranty
- E. Project Record Documents
 - 1. Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
- D. Embedded Within Concrete:
 - 1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
 - 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
 - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

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- E. Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.
- F. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.
- G. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.
- H. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.

2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 262100 Low-Voltage Electrical Service Entrance.
- B. Fittings for Grounding and Bonding: Also comply with Section 260526.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 3/4 inch (21 mm) trade size.
 - 4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
 - 5. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6. Underground, Exterior: 3/4 inch (21 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - 2. Republic Conduit: www.republic-conduit.com/#sle.
 - 3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.
 - 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
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5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Thomas & Betts Corporation: www.tnb.com.
 - 2. Robroy Industries: www.robroy.com.
 - 3. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- D. Interior Coating: Urethane, minimum thickness of 2 mil (0.05 mm).
- E. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location. Provide expanded fill type conduit sealing fittings where required to meet conduit fill requirements of conduit system.
 - 4. Material: Use steel or malleable iron.
 - 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
 - 6. Interior Coating: Urethane, minimum thickness of 2 mil (0.05 mm).
- F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.

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- 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360. Minimum trade size shall be 1/2-inch. 3/8-inch size fittings may be used for terminations to lighting fixtures provided conduit fill requirements of the National Electrical Code is not exceeded.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc: www.cantexinc.com/#sle.
 - 2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - 3. JM Eagle: www.jmeagle.com/#sle.
 - 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 80 where indicated; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
 - 1. Product: 3M Scotchrap Tape 51 or approved equal..
 - 2. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
 - 1. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Rope: Use nylon cord with average breaking strength of not less than 200 pounds for conduit in interior locations and 2000 pounds for conduit in exterior locations. Install metallic location cables where indicated..
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.

- G. Flexible conduit couplings in Class I, Division1 Hazardous Areas: Shall be steel metallic type, suitable for grounding, UL 886, liquid tight for wet locations, bronze braid covering and flexible brass core. Minimum trade size shall be 1/2-inch.
 - 1. Product: Crouse-Hinds ECGJH and ECLK series or approved equal.
 - 2. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- H. Connectors for flexible conduit: insulated throat type rated as suitable for system ground continuity.
 - 1. Connectors for liquid-tight flexible conduit shall be screw-in ground cone type.
- I. Expansion and deflection couplings: UL 467, UL 514B. Couplings shall accomodate 3/4-inch deflection, expansion, or contraction in any direction and shall allow 30 degrees angular deflections. Couplings shall contain an internal flexible metal braid to maintain raceway system ground continuity.
- J. Fire and smoke stop materials shall be, rock wool fiber, silicone foam, or silicone sealant, U.L. rated to maintain the fire floor and fire wall partition rating.
- K. Warning tape: 6-inch wide continuous yellow plastic warning tape 6 inches below surface over cables or conduit, or as indicated, before final backfill. Tape to indicate buried electrical cables below.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

3.02 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- H. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.
- I. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- J. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.

- 2. When conduit destination is indicated without specific routing, determine exact routing required.
- 3. Conceal all conduits unless specifically indicated to be exposed.
- 4. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
- 5. Arrange conduit to maintain adequate headroom, clearances, and access.
- 6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
- 7. Arrange conduit to provide no more than 150 feet (46 m) between pull points, unless indicated otherwise.
- 8. Route conduits above water and drain piping where possible.
- 9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
- 10. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
- 11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
- 12. Group parallel conduits in the same area together on a common rack.
- 13. Where transition is made from below grade PVC installation to a metallic conduit system above grade or slab, make transition with PCV-coated, galvanized, rigid steel conduit. For corrosion protection, where the elbow penetrates surface, provide PVC-coated conduit. Corrosion protection shall extend for 6 inches above and below concrete surface.
- K. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping (unless indicated otherwise), ductwork, or other systems.
 - 3. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 4. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 7. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 - 8. Use of spring steel conduit clips for support of conduits is not permitted.
 - 9. Use of wire for support of conduits is not permitted.
 - a. For securing conduits to studs in hollow stud walls.
 - b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).
 - 10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- L. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

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- 3. Use suitable adapters where required to transition from one type of conduit to another.
- 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
- 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
- 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
- 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
- 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- M. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.
 - 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 - 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
- N. Underground Installation:
 - 1. Provide trenching and backfilling in accordance with Section 31 00 00.00.
 - 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
 - c. Install top of conduit 30-inches minimum below grade, below roads and any other paved surfaces where indicated..
 - 3. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.
- O. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
 - 1. Include proposed conduit arrangement with submittals.
 - 2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
 - 3. Minimum Conduit Spacing: in accordance with National Electrical Code.
 - 4. Install conduits within middle one third of slab thickness.
 - 5. Secure conduits to prevent floating or movement during pouring of concrete.
- P. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00.00 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- Q. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- R. Hazardous (Classified) Locations: Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits enter or leave hazardous locations.
 - 2. Where otherwise required by NEC.
 - 3. At each entrance of arcing devices in hazardous locations.
 - 4. Where indicated on drawings.
- S. Hazardous (Classified) Locations:
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- 1. Install drain and inspection fittings in conduit seals which are at a low point in the conduit run and in all seals installed vertically.
- 2. Provide expanded fill conduit sealing fittings where required by the NEC.
- T. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittingsor approved flexible connections (abovegrade only) to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 - 3. Where conduits are subject to earth movement by settlement or frost.
- U. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
 - 1. Where conduits pass from outdoors into conditioned interior spaces.
 - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- V. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- W. Provide grounding and bonding in accordance with Section 260526.
- X. Identify conduits in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- C. Correct deficiencies and replace damaged or defective conduits.

3.05 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.06 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16 BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes for hazardous (classified) locations.

1.02 RELATED SECTIONS

- A. Section 033000.00 Cast-In-Place Concrete for Fueling.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260533.13 Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- F. Section 337119 Electrical Underground Ducts, Ductbanks, and Manholes: Concrete ductbanks for electrical systems.

1.03 REFERENCES

- A. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 Standard for Installing and Maintaining Wiring Devices 2016.
- C. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).
- E. NEMA OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports 2013 (Reaffirmed 2020).
- F. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- G. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 Specifications for Underground Enclosure Integrity 2017.
- I. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 508A Industrial Control Panels Current Edition, Including All Revisions.
- L. UL 514A Metallic Outlet Boxes Current Edition, Including All Revisions.
- M. UL 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- N. UL 1203 Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

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- 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
- 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
- 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
- 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
- 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
- 6. Coordinate the work with other trades to preserve insulation integrity.
- 7. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. See Section 260500 Electrical General, for submittal procedures.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for:
 - 1. Cabinets and enclosures.
 - 2. Boxes for hazardous (classified) locations.
- D. Closeout Submittals
 - 1. Warranty
- E. Project Record Documents: Record actual locations for pull boxes, cabinets and enclosures, and underground boxes/enclosures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.1. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
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- 3. Use cast iron boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used unless indicated otherwise.
- 4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
- 5. Use suitable concrete type boxes where flush-mounted in concrete.
- 6. Use raised covers suitable for the type of wall construction and device configuration where required.
- 7. Use shallow boxes where required by the type of wall construction.
- 8. Do not use "through-wall" boxes designed for access from both sides of wall.
- 9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
- 10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
- 11. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
- 12. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
- 13. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
- 14. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
- 15. Wall Plates: Comply with Section 262726.
- 16. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
 - f. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Outdoor Locations: Type 3R, painted steel.
 - Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 a. Provide hinged-cover enclosures unless otherwise indicated.
 - 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 - 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 - 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 1. Manufacturers:
 - a. Appleton, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - b. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

3.02 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flushmounted boxes where indicated.
 - 8. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- C. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
 - 1. Unless dimensioned, box locations indicated are approximate.
 - 2. Locate boxes as required for devices installed under other sections or by others.
 - 3. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 4. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in

accordance with Section 260533.13.

- H. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structureexcept for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping (unless indicated otherwise), ductwork, or other systems.
- I. Install boxes plumb and level.
- J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- K. Close unused box openings.
- L. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- M. Provide grounding and bonding in accordance with Section 260526.
- N. Identify boxes in accordance with Section 260553.

3.04 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.05 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Underground warning tape.
- E. Warning signs and labels.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings.
- B. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCES

- A. ANSI Z535.2 American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).
- C. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 Marking and Labeling Systems Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. See Section 260500 Electrical General for submittals procedures.
- C. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for the following:
 - a. Identification Labels.
 - b. Wire and Cable Markers.
 - c. Underground Warning Tape.
 - d. Warning Signs and Labels.
 - e. Identification Nameplates.
- D. Shop Drawings

1

- Schedule of Items to be Identified
 - a. Provide schedule indicating proposed designations, materials, legends, and formats.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door.Identify spares and spaces.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device.Do not identify spares and spaces.
 - b. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
 - c. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - d. Enclosed Contactors:
 - 1) Identify contactor with project nomenclature or tag, as indicated.
 - 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
 - 3. Emergency System Equipment:
 - a. Use identification nameplate to identify emergency system equipment in accordance with NFPA 70.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
 - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
 - 4. Use identification nameplate to identify panelboards utilizing a high leg delta system in accordance with NFPA 70.
 - 5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 - 6. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
 - 7. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service

factor, voltage, and phase of motor(s) controlled.

- 8. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099713.00 Fuel System Coatings.
- Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 a. Service equipment.
- 10. Arc Flash Hazard Warning Labels: Comply with Section 260573.
- 11. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 - 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - 4. Use underground warning tape to identify direct buried cables.
- D. Identification for Raceways:
 - 1. Use indentification lables to identify EFSO for accessible conduits at maximum intervals of 30 feet (9.2 m) and within 24 inch (610 mm) of any wall penetration or termination point.
 - a. Color-Coded Bands: Use vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
 - 1) Color Code:
 - (a) EFSO: Red.
 - 2. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 - 3. Use underground warning tape to identify underground raceways.
- E. Identification for Boxes:
 - 1. Use similar method for raceway and conduit to identify boxes as to function or corresponding conduit junction.
 - 2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- F. Identification for Devices:
 - 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - 2. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 - 3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

260553 - Identification for Electrical Systems

- 1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - c. Seton Identification Products: www.seton.com.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
- 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically nonconductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
- 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laseretched text.
- 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
- 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - d. Brimar Industries, Inc: www.brimar.com.
 - e. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Outdoor lables shall be rated and listed for such use.
 - 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 - 1. Unless shown on drawings or specified elsewhere, the following sizes shall be met:
 - a. Panelboards: 1 inch (25 mm)1 inch (25 mm) with 1/2 inch (13 mm) lettering on line 1 and 1/8 inch (3 mm) on line 2.
 - b. Industrial Control Panels: 1-1/2 inch (38 mm) with 1 inch (25 mm) lettering if single line or 7/8 inch (22 mm).
 - 2. Legend:
 - a. System designation where applicable:
 - 1) EFSO: Identify with text "EFSO".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height:
 - a. System Designation: 1 inch (25 mm).
 - b. Equipment Designation: 1/2 inch (13 mm).
 - c. Other Information: 1/4 inch (6 mm).
 - d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
 - 5. Color:
 - a. Normal Power System: White text on black background.

260553 - Identification for Electrical Systems

- b. EFSO System: White text on red background.
- D. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch (6 mm).
 - 5. Color: Black text on white background unless otherwise indicated.
 - a. Exceptions:
 - 1) Provide white text on red background for general information or operational instructions for emergency systems.
 - 2) Provide white text on red background for general information or operational instructions for EFSO systems.
- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch (13 mm).
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. HellermannTyton: www.hellermanntyton.com.
 - 3. Panduit Corp: www.panduit.com/#sle.
 - 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl self-laminating, heatshrink sleeve, plastic sleeve, or plastic clip-on type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch (3 mm).
- G. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.brimar.com/#sle.
 - 2. Clarion Safety Systems, LLC: www.clarionsafety.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 016000 Product Requirements.
 - 5. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- D. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or selfadhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.
- C. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.

- 7. Conduits: Legible from the floor.
- 8. Boxes: Outside face of cover.
- 9. Conductors and Cables: Legible from the point of access.
- 10. Devices: Outside face of cover.
- D. Install identification products centered, level, and parallel with lines of item being identified.
- E. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 - 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- F. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- G. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- H. Secure rigid signs using stainless steel screws.
- I. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

SECTION 262100 LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems.
- C. Section 260533.13 Conduit for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- E. Section 262416 Panelboards: Service entrance equipment.
- F. Section 264300 Surge Protective Devices: Service entrance surge protective devices.
- G. Section 337119 Electrical Underground Ducts, Ductbanks, and Manholes.

1.03 REFERENCE STANDARDS

- A. IEEE C2 National Electrical Safety Code(R) (NESC(R)) 2023.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- C. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
 - 1. Verify the following with Utility Company representative:
 - a. Utility Company requirements, including division of responsibility.
 - b. Exact location and details of utility point of connection.
 - c. Utility easement requirements.
 - d. Utility Company charges associated with providing service.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
 - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
 - 1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

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1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. IEEE C2 (National Electrical Safety Code).
 - 2. NFPA 70 (National Electrical Code).
 - 3. The requirements of the Utility Company.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: As indicated on drawings.
- D. Division of Responsibility: As indicated on drawings.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required support and attachment components in accordance with Section 260529.
- E. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

SECTION 262200 LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260533.13 Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- F. Section 262416 Panelboards.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.
- B. IEEE C57.94 IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.
- C. IEEE C57.96 IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.
- D. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 409 Standard for Installing and Maintaining Dry-Type Transformers 2015.
- F. NEMA ST 20 Dry Type Transformers for General Applications 2021.
- G. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- H. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- I. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 Standard for Specialty Transformers Current Edition, Including All Revisions.
- K. UL 1561 Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point

C. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
 - 1. Greater than 10 kVA: 104 degrees F (40 degrees C) maximum.
 - 2. Less than 10 kVA: 77 degrees F (25 degrees C) maximum.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
 - 1. Less than 3 kVA: None.
 - 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
 - 4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20
- G. Mounting Provisions:
 - 1. Less than 15 kVA: Suitable for wall mounting.
 - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 3. Larger than 75 kVA: Suitable for floor mounting.
- H. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

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- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 - 1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
 - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 262416 PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Load centers.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems.
- C. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- D. Section 262200 Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.
- E. Section 264300 Surge Protective Devices.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 Panelboards 2011.
- F. NEMA PB 1.1 General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- H. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 67 Panelboards Current Edition, Including All Revisions.
- L. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flushmounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
 - 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 - 4. Include documentation of listed series ratings upon request.
- D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.1. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Approved Equal.

F. Substitutions: See Section 260500 - Electrical General and Section 012500 - Substitution Procedures.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided, list and label panelboards as a complete assembly including surge protective device.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Copper.
 - 2. Ground Bus Material: Copper.

- D. Circuit Breakers:
 - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.
 - 2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

2.04 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Bus Material: Copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.
 - 2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Lug Material: Copper, suitable for terminating copper conductors only.
 - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 - 6. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide grounding and bonding in accordance with Section 260526.
- J. Install all field-installed branch devices, components, and accessories.
- K. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- C. Test GFCI circuit breakers to verify proper operation.
- D. Test shunt trips to verify proper operation.
- E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 262816.16 ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 260500 Electrical General
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- I. UL 869A Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify General Contractor/Construction Manager and Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include wiring diagrams showing all factory and field connections.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Project Record Documents: Record actual locations of enclosed switches.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Approved Equal.
- F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where indicated, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 263213 ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged engine generator system and associated components and accessories:
 - 1. Engine and engine accessory equipment.
 - 2. Alternator (generator).
 - 3. Generator set control system.
 - 4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM D975 Standard Specification for Diesel Fuel 2022a.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA/EGSA 404 Standard for Installing Generator Sets 2014.
- D. NEMA MG 1 Motors and Generators 2021.
- E. NFPA 30 Flammable and Combustible Liquids Code 2021, with Amendment.
- F. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 110 Standard for Emergency and Standby Power Systems 2022.
- H. UL 142 Steel Aboveground Tanks for Flammable and Combustible Liquids Current Edition, Including All Revisions.
- I. UL 1236 Battery Chargers for Charging Engine-Starter Batteries Current Edition, Including All Revisions.
- J. UL 2200 Stationary Engine Generator Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
 - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
 - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
- D. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- F. Manufacturer's factory emissions certification.
- G. Source quality control test reports.
- H. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
 - 1. Certified prototype tests.
 - 2. Torsional vibration compatibility certification.
 - 3. NFPA 110 compliance certification.
 - 4. Certified rated load test at rated power factor.
- I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- J. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70 (National Electrical Code).
 - 2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
 - 3. NFPA 30 (Flammable and Combustible Liquids Code).
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a

complete operating system that provides the functional intent indicated.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. System Description:

b.

- 1. Application: Emergency/standby.
- 2. Configuration: Single packaged engine generator set operated independently (not in parallel).
- 3. Total System Power Rating: 175 kW, standby.
- D. Packaged Engine Generator Set:
 - 1. Type: Diesel (compression ignition).
 - 2. Power Rating: 175 kW, standby.
 - 3. Voltage: 480Y/277 V, 3 phase, 60 Hz.
 - 4. Main Line Circuit Breaker:
 - a. Type: Thermal magnetic.
 - Trip Rating: As indicated on drawings.
- E. Generator Set General Requirements:
 - 1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
 - 2. Factory-assembled, with components mounted on suitable base.
 - 3. List and label engine generator assembly as complying with UL 2200.
 - 4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
 - 5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
 - 6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.
- F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
- G. Starting and Load Acceptance Requirements:
 - 1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
 - 2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
 - 3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
- H. Exhaust Emissions Requirements:
 - 1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
 - 2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.02 ENGINE AND ENGINE ACCESSORY EQUIPMENT

- A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
- B. Engine Fuel System Diesel (Compression Ignition):
 - 1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
 - 2. Fuel Storage: Sub-base fuel tank.
 - 3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.

- 4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
- 5. Sub-Base Fuel Tank:
 - a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
 - b. Tank Capacity: Size for minimum of 8 of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
 - c. Features:
 - 1) Direct reading fuel level gauge.
 - 2) Normal atmospheric vent.
 - 3) Emergency pressure relief vent.
 - 4) Fuel fill opening with lockable cap.
 - 5) Dedicated electrical conduit stub-up area.
- C. Engine Starting System:
 - 1. System Type: Electric, with DC solenoid-activated starting motor(s).
 - 2. Battery(s):
 - a. Battery Type: Lead-acid.
 - b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
 - c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
 - 3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
 - 4. Battery Charger:
 - a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
 - b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
 - c. Recognized as complying with UL 1236.
 - d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
 - e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
 - f. Provide alarm output contacts as necessary for alarm indications.
- D. Engine Speed Control System (Governor):
 - 1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
 - 2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.
- E. Engine Lubrication System:
 - 1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
- F. Engine Cooling System:
 - 1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and enginedriven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
 - 2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
- G. Engine Air Intake and Exhaust System:
 - 1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.

2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.03 ALTERNATOR (GENERATOR)

- A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
- B. Exciter:
 - 1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
 - 2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
 - 3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
- C. Temperature Rise: Comply with UL 2200.
- D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.
- E. Enclosure: NEMA MG 1, drip-proof.
- F. Total Harmonic Distortion: Not greater than five percent.

2.04 GENERATOR SET CONTROL SYSTEM

- A. Control Panel:
 - 1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
 - 2. Generator Set Control Functions:
 - a. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
 - b. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
 - c. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
 - d. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
 - e. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
 - f. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
 - 3. Generator Set Status Indications:
 - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
 - b. Current (Amps): For each phase.
 - c. Frequency (Hz).
 - d. Real power (W/kW).
 - e. Reactive power (VAR/kVAR).
 - f. Apparent power (VA/kVA).
 - g. Power factor.
 - h. Duty Level: Actual load as percentage of rated power.
 - i. Engine speed (RPM).
 - j. Battery voltage (Volts DC).
 - k. Engine oil pressure.
 - I. Engine coolant temperature.
 - m. Engine run time.
 - n. Generator powering load (position signal from transfer switch).
 - 4. Generator Set Protection and Warning/Shutdown Indications:
 - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
 - 1) Overcrank (shutdown).
 - 2) Low coolant temperature (warning).
 - 3) High coolant temperature (warning).
 - 4) High coolant temperature (shutdown).
 - 5) Low oil pressure (shutdown).

- 6) Overspeed (shutdown).
- 7) Low fuel level (warning).
- 8) Low coolant level (warning/shutdown).
- 9) Generator control not in automatic mode (warning).
- 10) High battery voltage (warning).
- 11) Low cranking voltage (warning).
- 12) Low battery voltage (warning).
- 13) Battery charger failure (warning).
- b. In addition to NFPA 110 requirements, provide the following protections/indications:
 - 1) High AC voltage (shutdown).
 - 2) Low AC voltage (shutdown).
 - 3) High frequency (shutdown).
 - 4) Low frequency (shutdown).
 - 5) Overcurrent (shutdown).
- c. Provide lamp test function that illuminates all indicator lamps.
- 5. Other Control Panel Features:
 - a. Event log.

2.05 GENERATOR SET ENCLOSURE

- A. Enclosure Type: Weather protective (non-sound attenuating).
- B. Enclosure Material: Steel or aluminum.
- C. Hardware Material: Stainless steel.
- D. Color: Manufacturer's standard.
- E. Access Doors: Lockable, with all locks keyed alike.
- F. Openings: Designed to prevent bird/rodent entry.
- G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

2.06 SOURCE QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.
- C. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
- D. Arrange equipment to provide minimum clearances and required maintenance access.
- E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.
- F. Provide required support and attachment in accordance with Section 260529.
- G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Identify system wiring and components in accordance with Section 260553.

3.02 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.03 MAINTENANCE

- A. See Section 017000 Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

SECTION 264300 SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surge protective devices for service entrance locations.
- B. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 262416 Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

- A. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- D. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1449 Standard for Surge Protective Devices Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013300 Compliance Submittals, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
- C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- 264300 Surge Protective

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Field-installed, Externally Mounted Surge Protective Devices:
 1. Schneider Electric; Square D Brand Products: www.se.com/#sle.
- B. Substitutions: See Section 260500 Electrical General and Section 013300 Compliance Submittals.
- C. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
 - 1. Wye Systems: L-N, L-G, N-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
 - 1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
 - 2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 1. Outdoor locations: Type 3R.
- H. Mounting for Field-installed, Externally Mounted SPDs: As indicated on the drawings.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Surge Protective Device:
 - 1. Protection Circuits: Field-replaceable modular or non-modular.
 - 2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
 - 3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
 - 4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
 - 5. Diagnostics:
 - a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

2.04 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

- A. Surge Protective Device:
 - 1. Protection Circuits: Field-replaceable modular or non-modular.
 - 2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
 - 3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
 - 4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
 - 5. Diagnostics:

a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- B. Verify system grounding and bonding is in accordance with Section 260526 Grounding and Bonding for Electrical Systems, including bonding of neutral and ground for service entrance where applicable. Do not energize SPD until deficiencies have been corrected.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 - Grounding and Bonding for Electrical Systems where applicable. Replace SPDs damaged by improper or missing neutralground bond.

SECTION 265600 EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

- A. Exterior luminaires.
- B. Poles and accessories.
- C. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260533.16 Boxes for Electrical Systems.

1.03 REFERENCES

- A. AASHTO LTS Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals 2013, with Editorial Revision (2022).
- B. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- C. IEEE C62.41.2 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- D. IES LM-79 Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
- E. IES LM-80 Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
- F. NECA 1 Standard for Good Workmanship in Electrical Construction 2015.
- G. NECA/IESNA 501 Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).
- H. NEMA 410 Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Disharge Ballasts 2020.
- I. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1310 Class 2 Power Units Current Edition, Including All Revisions.
- K. UL 1598 Luminaires Current Edition, Including All Revisions.
- L. UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 260500 Electrical General, for submittal procedures.
- B. See Section 013300 Compliance Submittals, for submittal procedures.
- C. Product Data:
 - 1. Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 2. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include product data.
 - 3. Poles:

- a. Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- b. Include product data.
- 4. Tank PlatformLighting:
 - a. Include product data on luminaires, poles and mounting hardware/accessories.
- D. Shop Drawings:
 - 1. Luminaires:
 - a. Indicate dimensions for each luminaire that is not a standard product of the manufacturer, provide photometric calculations where luminaires are proposed for substitution upon request, and provide structural calculations for each pole proposed for substitution.
 - b. Provide photometric calculations where luminaires are proposed for substitution upon request
 - 2. Provide structural calculations for each pole proposed for substitution
- E. Quality Assurance
 - 1. Test Reports
 - a. Include test report indicating measured illumination levels.
 - 2. Certifications
 - a. Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria
- F. Closeout Sumbittals

a.

- 1. See Section 017800 Closeout Submittals, for additional warranty requirements.
 - Provide five year manufacturer warranty for all LED luminaires, including drivers.
 1) The LED manufacturer shall provide a written 5-year on-site replacement "finish" warranty for luminaires. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking or fading.
 - The LED manufacturer shall provide a written five-year on-site replacement warranty for defective or non-starting power supply units and LED source assemblies, which include, but are not limited to, LED packages, LED arrays, LED modules, LED dies, encapsulates, and phosphors, package, array, or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array or module failing to illuminate.
 - 3) The LED manufacturer shall provide a written five-year on-site replacement warranty for any LED source assembly, package, array, or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array or module failing to illuminate.
 - 4) The LED manufacturer warranty period shall begin on the date of final acceptance. Submitted by the installing contractor a Certificate for Luminaire Useful Life from the manufacturer indicating that the expected useful life of the provide luminaires. The useful life shall be directly correlated to the IES LM-80 test data, interpreted per IESNA TM-21. Minimum LED life shall be 50,000 hours.
 - b. Provide three year manufacturer warranty for LED retrofit luminaire conversion kits.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated on lighting details included on the drawings.
- B. Substitution: Sec Section and Section 260500 Electrical General.

2.02 LUMINAIRES

- A. Manufacturers:
 - 1. Acuity Brands, Inc; Lithonia Lighting: www.acuitybrands.com.
 - 2. AZZ; www.azz.com
 - 3. Eaton Crouse-Hinds: www.eaton.com
 - 4. Substitutions: See Section 260500 Electrical General and 012500 Substitution Procedures.
- B. Fixtures shall be selected from the fixture schedule not only by catalog number but with consideration to mounting, number and types of lamps, and reference notes as contained in the fixture schedule, and in accordance with these specifications.
- C. Fixtures shall have no uplight or shall come with accessories to prevent any uplight from light fixture.
- D. Provide products that comply with requirements of NFPA 70.
- E. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
- G. Provide products complying with Federal Energy Management Program (FEMP) requirements.
- H. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- I. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- J. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- K. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- L. Shall be rated to operate between ambient temperatures of minus 30 degrees C and 40 degrees C.
- M. Area luminaire housing finish shall be baked-on enamel, anodized, or baked-on powder coat paint. Finish shall be capable of surviving ASTM B117 salt fog environment testing for 2500 hours minimum without blistering or peeling.
- N. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.
- O. Luminaire arm bolts shall be 304 stainless steel or zinc-plated steel.
- P. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
 - 4. LED Useful Life shall be as defined as the operating hours before reaching 70% of the initial rated lumen output point with no catastrophic failures under normal conditions.
 - 5. LED luminaire housings shall be die cast or extruded aluminum. Fabricated aluminum housings shall have all seams and corners internally welded to resist weathering, moisture and dust.

 LED luminaires shall produce a minimum efficacy as indicated, tested per IES LM-79. Theoretical models of initial raw LED lumens per watt are not acceptable: Exterior pole mounted area fixtures: 65 lumens/watt.

2.03 POLES

- A. Manufacturers:
 - 1. Acuity Brands, Inc; Lithonia Lighting: www.acuitybrands.com.
 - 2. Substitutions: See Section and Section 260500 Electrical General .
- B. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
 - 2. Structural Design Criteria:
 - a. Comply with AASHTO LTS.
 - b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
 -) Design Wind Speed: 100 miles per hour, , with gust factor of 1.3.
 - c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
 - d. Provide vibration damper..
 - 3. Material: Steel, unless otherwise indicated.
 - 4. Shape: Square straight, unless otherwise indicated.
 - 5. Finish: Match luminaire finish, unless otherwise indicated.
 - 6. Mounting Height: as indicated on plans.
 - 7. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
 - 8. Unless otherwise indicated, provide with the following features/accessories:
 - а. Тор сар.
 - b. Handhole, minimum of 2.5 by 5 inches size.
 - c. Anchor bolts with leveling nuts or leveling shims.
 - d. Anchor base cover.
 - e. Brackets.
 - f. Pole-top tenon.
- C. Metal Poles: Provide ground lug, accessible from handhole.

2.04 AREA LIGHTING

A. Fixture shall be Lothonia Lighting model DSX1 LED P1 40K T4M MVOLT BBLXD or approved equal.

2.05 TANK PLATFORM/GSE TANK LIGHTING

- A. Pole shall be telescoping type, galvanized steel pole, shall be Eaton Crouse Hinds V-Spring telescoping lighting pole model V65 H-G-JM5-XXX or approved equal. Provide conduit fittings and mounting options and hardware as required for a complete installation.
- B. Luminaire shall be Eaton Crouse-Hinds VMVL-3-N-J-R1-UNV1. Fixture must be UL listed for use in Class I, Division 2, Group D, T3 hazardous areas and must be suitable for use in conjunction with the V-Spring pole in these areas.

2.06 ELECTRICAL RACK CANOPY LIGHTING

A. Fixture shall be Lithonia Lighting model CSVT L48 ALO3 MVOLT 40K 80CRI or approved equal and shall mount flush with canopy support beam. No chain hung allowed.

2.07 FUELING SKIDS CANOPY LIGHTING

A. Fixture shall be AZZ model XP-50L-4-2L-U on loading skids model XP-40L-2-3L-U on unloading skid or approved equal and shall mount flush with canopy support beam. No chain hung allowed.

2.08 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Provide lighting contactor for uniform control of site lighting.
 - 1. Provide Hand-Off-Auto switch.
 - 2. Coil shal be 120V and electrically held.
 - 3. Contacts rated for 277V minimum.
 - 4. Number of poles: 2 minimum

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install products in accordance with manufacturer's instructions.
- E. Install luminaires in accordance with NECA/IESNA 501.
- F. Provide required support and attachment in accordance with Section 260529.
- G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- E. Measure illumination levels at night with calibrated meters to verify conformance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 017800 Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 310000.00 SITE PREPARATION AND EARTHWORK FOR FUELING

PART 1 - GENERAL

1.01 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C31-12 Making and Curing Concrete Test Specimens in the Field.
 - 2. C33-13 Concrete Aggregates.
 - 3. C39-12a Compressive Strength on Cylindrical Concrete Specimens.
 - 4. C88-05 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 5. C117-13 Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - 6. C131-06 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 7. C136-06 Sieve Analysis of Fine and Coarse Aggregates.
 - 8. C144-11 Aggregate for Masonry Mortar.
 - 9. C150-12 Portland Cement.
 - 10. C618-12a Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 11. D1241-07 Materials for Soil-Aggregate Subbase, Base and Surface Courses.
 - 12. D1556-07 Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - D1557-12 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft. lbf/ft3 (2,700 kN-m/mm3).
 - 14. D1586-11 Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.
 - 15. D2487-11 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 16. D3786-13 Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.
 - 17. D3787-11 Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test.
 - 18. D4253-06 Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - 19. D4254-06e1 Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - 20. D4318-10 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 21. D4429-9a CBR (California Bearing Ration) of Soils in Place.
 - 22. D4491-09 Water Permeability of Geotextiles by Permittivity.
 - 23. D4533-11 Trapezoid Tearing Strength of Geotextiles.
 - 24. D4546-08 One-Dimensional Swell or Collapse of Cohesive Soils.
 - 25. D4632-13e1 Grab Breaking Load and Elongation of Geotextiles.
 - 26. D4751-12 Determining the Apparent Opening Size of a Geotextile.
 - 27. D4832-10 Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
 - 28. D4833-13e1 Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 - 29. D6103-17 Standard Test Method for Flow Consistency of Controlled Low Strength Material.
 - 30. D6938-10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- B. Occupational Safety and Health Administration (OSHA):
 - 1. 29 CFR Part 1926-07 Safety and Health Regulations for Construction.

1.02 SUBMITTALS

- A. Submit as specified in Section 01 33 00.00.
- B. Product Data

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

- 1. Compaction equipment to be used for fill, trench backfill, and other backfill operations (for information only and not for Engineer approval).
- 2. Warning tape and location wire data
- 3. Riprap data.
- 4. Pipe bedding and aggregate materials data
- C. Quality Assurance
 - 1. Design Data
 - a. Professional Engineer Design
 - Where selecting an option for excavation, trenching, and shoring design from "OSHA Part 1926," submit (For information only and not for Engineer approval) copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems approved by the Responsible person or Contractors Registered Professional Engineer.
 - 2. Test Reports
 - a. Test results from laboratory testing of proposed borrow materials.
 - b. Pipe bedding and aggregate materials tests.
 - c. Flowable fill.
 - d. Aggregate Base tests and sieve analysis.
- e. Compaction

1.03 QUALITY ASSURANCE

- A. Tests of all Contractor-secured materials and products being submitted for approval to determine conformance with these specifications, including borrow materials (both on-or off-site) proposed for use, shall be performed by an independent testing laboratory retained and compensated by the Contractor.
- B. As materials are incorporated into the Project, on-site and off-site quality control tests will be performed during construction to determine conformance with Drawings and Specifications by an independent testing laboratory retained and compensated by the Owner. Frequency of on-site and off-site testing is specified in PART 3.

1.04 PROJECT/SITE CONDITIONS

- A. Lines and grades shall be as indicated. Owner will furnish reference points as necessary to permit the Contractor to lay out and construct the work properly.
- B. Carefully maintain all reference points and replace as directed by the Owner if disturbed or destroyed.
- C. Temporary Erosion, Dust and Sediment Controls: This work shall consist of furnishing, installing, and constructing temporary measures to control erosion and minimize the siltation of intermittent streams as well as prevent siltation of open trenches or other excavations.
 - Temporary erosion and sediment control facilities (i.e., silt fences, sediment traps, or other measures) shall be constructed in compliance with local, state, federal, and jurisdictional agency regulations.
 - 2. Maintain all erosion control facilities and replace when damaged.
- D. Disposition of Utilities:
 - 1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.
 - 2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug, or cap as directed by the Engineer.
 - 3. Provide a minimum 48-hours'notice to the Engineer and receive written notice to proceed before interrupting any utility.
- E. New spot and contour elevations shown on the contract drawings are finish grade in unpaved areas and top of pavement in paved areas.
- F. Geotechnical information is available for this project and can be obtained from the Engineer.

G. Stockpiling of topsoil and other excavated materials will be permitted on the owners property at a location designated by the owner.

PART 2 - PRODUCTS

2.01 MATERIALS ENCOUNTERED

- A. Materials suitable for use in backfill and fill include material that is clean and free of contamination, debris, roots, organic matter, and frozen matter and which is free of stone having any dimension greater than ½ the specified layer thickness. Materials shall not exhibit characteristics of high shrink-swell potential as determined from Atterberg limit tests (ASTM D4318) and/or swell/pressure tests (ASTM D4546). For soils used below structural elements, such as footings, slabs, pavements, and mats, that portion of material passing the No. 40 sieve shall have a liquid limit not exceeding 40 and a plasticity index not exceeding 25 when tested in accordance with ASTM D4318.
 - 1. When backfill and fill source material is stratified or exists as segregated deposits of material which individually are and are not suitable fill as specified, the contractor will be allowed to mechanically mix the soil material and use it as fill if the blended material meets the specified requirements for suitable fill and backfill material. Mixing or other conditioning of soil material necessary to make it conform to the specified requirements for fill shall be done at no additional cost to the Owner.
 - 2. Conforming to the following:
 - a. Soluble Chlorides < 0.02%
 - b. Sulfate Content < 0.2%
 - c. Sodium Sulfate Content < 0.2%
 - d. Percent Swell < 4%
- B. Materials unsuitable for use in backfill and fill include all material that contains debris, roots, organic matter, frozen matter, stone (with any dimension greater than ½ the layer thickness), or other materials that are determined by Engineer as too wet or otherwise unsuitable for providing a stable fill, subgrade, or foundation for structures.
- C. Materials suitable for backfill of utility trenches and structures shall be as specified for backfill and fill except that no stones or particles may exceed 50 mm (2 inches).
- D. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands generally exclusive of clayey and silty material. Cohesionless materials are free-draining materials for which impact compaction will not produce a well defined moisture-density relationship curve and for which the maximum density by impact methods will generally be less than by vibratory methods. Generally less than 15% by dry weight of soil particles pass a No. 200 sieve. Cohesionless materials are typically classified by ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless when fines have a plasticity index of zero.
- E. Cohesive materials include silts and clays generally exclusive of sands and gravel and are materials for which impact compaction will produce a well-defined moisture-density relationship curve. Cohesive materials are typically classified by ASTM D2487 as GC, SC, ML, CL, MH, and CH. Material classified as GM and SM will be considered cohesive when the fines have a plasticity index greater than zero.
- F. Rock is defined as solid, homogeneous, interlocking crystalline material with firmly cemented, laminated, of foliated masses or conglomerate deposits, none of which can be removed without systematic drilling and blasting, or the use of machine mounted hydraulic or pneumatic rock breakers. Rock also includes large boulders, buried masonry, or concrete other than pavement, exceeding 1 cubic yard(s). Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 greater than 600 blows per foot is arbitrarily defined herein as "Rock". Removal of "hard material" will not be considered rock excavation because of drilling and blasting that is performed merely to increase production.
- G. Hard material is defined as weathered rock, dense consolidated deposits or conglomerate materials, (excluding manmade materials such as concrete) which usually require the use of heavy excavation equipment with ripper teeth or large excavators for removal. Hard material

shall not be considered as rock and excavation of hard material shall not be cause for a claim for additional compensation regardless of hardness or difficulty in removing.

- H. All materials encountered, regardless of type, character, composition and condition thereof shall be unclassified. Estimate quantity of various materials included prior to submitting Bid Form. Rock encountered shall be handled at no additional cost to Owner.
- I. Rock excavation shall be measured and paid for by the cubic yard quantity of acceptably excavated rock material using plan elevations and sections for utilities and structures.
- J. Waste material includes excess usable materials and materials unsuitable for use in the Work.
- K. Borrow materials includes the following:
 - 1. Acceptable fill materials, granular materials, and topsoil obtained from locations arranged for by Contractor and required when sufficient suitable materials are not obtained from excavation and trenching.
 - 2. Obtaining, excavating, handling, and final placement of materials.

2.02 GRANULAR MATERIAL

A. Pipe bedding for all belowground piping shall be curshed rock bedding. Crushed rock bedding shall be crushed stone or crushed gravel conforming to ASTM C33 coarse aggregate, size No. 57 or 67.

ASTM C33	Size No. 57	Size No. 67	
<u>Sieve</u>	Percent Passing	Percent Passing	
1-1/2- inch	100		
1 inch	95 to 100	100	
3/4- inch		90 to 100	
1/2- inch	25 to 60		
3/8- inch		20 to 55	
No. 4	0 to 10	0 to 10	
No. 8	0 to 5	0 to 5	

- 1. Use at all locations where crushed rock is indicated and where drainage fill is required in conjunction with fire hydrants, or filter fabrics and subsurface drainage piping.
- B. Granular material for trench stabilization shall conform to requirements of crushed rock bedding.

2.03 CRUSHED ROCK BASE AND SUBBASE

- A. Aggregate shall be crushed stone or crushed gravel, free from lumps or balls of clay, dirt, or other objectionable matter and reasonably free from thin and elongated pieces or dirt. Aggregates shall consist of angular fragments, durable and sound, and shall be reasonably uniform in density and quality.
- B. Percentage of wear shall not exceed 50 after 500 revolutions as determined by ASTM C131.
- C. Aggregate shall contain 75% by weight of pieces with two or more fractured surfaces if material is crushed gravel.
- D. Portion of aggregate passing No. 40 sieve shall be as follows:
 - 1. Liquid Limit: Not more than 25 determined by ASTM D4318.
 - 2. Plastic Index: Not more than 6 determined by ASTM D4318.
- E. Gradation shall not vary from the low limit on one sieve to high limit on an adjacent sieve. Test by ASTM C136 and C117, and conform to ASTM D1241, gradation A or B as follows:

Percent By Weight Passing Square-Mesh Sievedhdsn			
Sieve Designation	Gradation A	Gradation B	
2-inch (50-millimeters)	100	100	

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	75 to 95
30 to 65	40 to 75
25 to 55	30 to 60
15 to 40	20 to 45
8 to 20	15 to 30
2 to 8	5 to 15
	 30 to 65 25 to 55 15 to 40 8 to 20 2 to 8

1. Similar local or state DOT gradations may be substituted for the ASTM gradations listed above and used with the Engineer's approval.

2.04 FLOWABLE FILL

- A. Flowable fill, also known as Controlled Low Strength Materials (CLSM), may be used in place of other pipe bedding materials with Engineer's approval.
- B. A flowable fill design mix shall be developed by an independent testing laboratory retained and paid by the Contractor. Mix shall consist of sand conforming to ASTM C33 or C144, fly ash conforming to ASTM C618, Portland cement conforming to ASTM C150 or other materials approved by the engineer and have a 28 day compressive strength of not less than 25 psi or more than 150 psi. The objective is to provide a flowable material that is self-leveling and completely fills spaces around pipe and structures and develops adequate strength to support loads while remaining easily excavatable. Mixes that produce 28 day compressive strengths consistently above 150 psi are unacceptable. In general, the water content in the mix should not be so high that it hydraulically inhibits consolidation of the material.
- C. Contractor may use a preexisting developed design mix conforming to the requirements of paragraph B above in lieu of developing a mix design specifically for this project.
- D. When specified for use in the project elsewhere, flowable fill material conforming to FAA P-153 Class 1 (50-150 psi) is acceptable in lieu of developing and producing a mix under this specification section, except that no aggregate material may be used that exceeds the gradations for sand and fine aggregate specified in the preceding paragraph B when the flowable fill is being placed within the bedding envelope for coated steel pipe. P-153 material may be used without restriction outside of the pipe bedding envelope and as bedding for other types of pipe without this fine aggregate restriction.

2.05 BACKFILL AND FILL MATERIAL

- A. Material shall be free of roots or other organic matter, refuse, debris, ashes, cinders, frozen earth, or other unsuitable material.
- B. Use suitable material sufficiently friable to provide a dense mass free of voids and capable of specified compaction.
- C. Do not use material containing gravel, stones, or shale particles greater in dimension than $\frac{1}{2}$ the depth of the layer to be compacted.
- D. Moisture content shall be that required to obtain specified compaction of the soil.
- E. Perform any wetting or drying of the material as required to obtain the specified density when compacted.

2.06 WARNING TAPES FOR UNDERGROUND UTILITIES

- A. For the purposes of early warning and identification of buried pipes during future trenching and excavation.
- B. Tape shall be plastic, acid- and alkali-resistant polyethylene film, at least 6 inches in width and 4 mils thick, of the color indicated, and continuously inscribed with at least 1-inch-high, black lettering, indicating type of buried line installed:
 - 1. "BURIED ELECTRIC LINE BELOW," red tape.
 - 2. "BURIED SEWER LINE BELOW," green tape.
- C. Install warning tape above all piping as indicated.

2.07 TRACER WIRE FOR NONMETALLIC AND DISCONTINUOUS PIPING:

- A. For the purposes of locating non-metallic and electrically discontinuous pipe, provide number 10 or larger water resistant XHHW (cross-linked high molecular weight polyethylene) coated solid copper tracer wire suitable for wet and buried service with main runs and branches of nonmetallic and other electrically discontinuous pipe. The wire shall be taped to the side of the pipe at intervals necessary to hold the wire in place during bedding and backfill with no metal to metal contact between metallic pipe or components and the tracer wire.
- B. Wire splices shall be made using an Engineer approved water resistant connector which protects the wire and connections from moisture and corrosion.
- C. Install 5/8" x 8' copper clad ground rod at locations indicated on the utility plans. If not indicated on plans, install a minimum of 2 rods at locations as directed by Engineer. The ground rod shall be installed at least 10 feet from any metallic component of the water system.
- D. Install tracer wire test/termination boxes at locations indicated on the project drawings. If locations are not shown on plans, locate one test box at each point where the main piping runs start and end, and at intervals along the piping at not more than 500 feet apart. For loop systems, install test at least 2 test stations at locations which approximately divide the loop into two equal parts, and additional stations as necessary to maintain a maximum separation between stations of 500 feet.
 - 1. Each test station shall have a riser section to house and protect the wire test points and termination, have a corrosion resistant termination/connection lug, and be equipped with a painted or coated cast iron cap color coded specifically for water per APWA utility marking color system. Test stations shall be "SnakePit" test stations as manufactured by Copperhead Industries, Monticello Minnesota or Engineer approved alternate.
- E. Tracer wire is generally required with PVC, HDPE, sewer, gas, unbonded ductile iron pipe for containment, water and other utilities. Tracer wire is not required for concrete, HDPE or other storm pipe systems unless specifically indicated on project drawings. Short extensions of existing utilities such as addition of a fire hydrant or short connections to water and sewer mains less than 50 feet do not require tracer wire unless specifically indicated on the project drawing.

2.08 RIPRAP

- A. Quarry-run stone with average size stones weighing 80 to 150 pounds each. At least 90% shall weigh more than 80 pounds each.
- B. Stones shall be durable, free from cracks, seams, and other defects which would tend to increase deterioration from natural causes.
- C. Dirt, sand, or clay shall not exceed 5% by weight.

2.09 GEOTEXTILES

- A. General:
 - 1. Specified property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.
- B. Geotextile fabrics for use under pavements and riprap shall be woven or nonwoven material as follows:
 - 1. Mullen Burst (ASTM D3787): ³600 psi
 - 2. Puncture Strength (ASTM D4833): ³120 psi
 - 3. Trapezoidal Tear Strength (ASTM D4533): ³110 pounds

PART 3 - EXECUTION

3.01 SITE PREPARATION

- A. See D-Series Sheets.
- B. Stripping:
 - 1. See CS-Series Sheets.
 - 2. Remove waste from the site.

3.02 EXCAVATION AND TRENCHING

- A. Sheeting, Shoring and Sloping:
 - 1. Use when required for slope stability and where resulting slopes from excavation or trenching might endanger people or in-place or proposed structures or utilities.
 - 2. Provide materials on site prior to start of excavation. Adjust spacing and arrangement as required by conditions encountered.
 - 3. Remove sheeting and bracing as backfill progresses. Fill voids left after withdrawal with sand or other approved fill material.
 - 4. The contractor is entirely responsible for excavation means, methods and safety, including compliance with OSHA 29 CFR Part 1926 Safety and Health Regulations for Construction. Excavation and trench details shown on the drawings have been provided for the sole purpose of addressing design issues related to the intended short and long term performance of the respective structures and utilities and conveying these requirements to the contractor. The presence of these details shall not be construed to mean or imply that site soils have been classified in accordance with OSHA safety requirements or that the engineer has designed or taken responsibility for design of systems related to excavation safety.
 - 5. Existing infrastructure, ongoing owner or tenant operations and project work limits may or will preclude some traditional trenching methods such as sloped sides and require others such as sheeting, shoring, trench boxes or others. The contractor is free to select and use any method or combination of methods that facilitate the work, and adequately protects workers and existing infrastructure to remain in service.
- B. Explosives: Blasting will not be permitted.
- C. Excavation for Structures:
 - 1. Excavate area adequate to permit efficient erection and removal of forms.
 - 2. Trim to neat lines where details call for concrete to be deposited against earth.
 - 3. Excavate by hand in areas where space and access will not permit use of machines.
 - 4. Notify Engineer immediately when excavation has reached the depth indicated.
 - 5. Restore bottom of excavation to proper elevation with compacted fill in areas overexcavated. If trench bottom is soft, replace overexcavated material with compacted crushed rock. Payment shall be negotiated with Owner for authorized replacement of unsuitable materials. Correct at no additional cost to Owner when trench is overexcavated without authority or to stabilize bottom rendered unsuitable through negligence or improper operations.
- D. Trenching for Underground Utilities:
 - 1. Side Walls:
 - a. Make vertical or sloped within specified trench width limits below a plane 12 inches above top of pipe.
 - b. Make vertical, sloped or stepped as required for stability, above a plane 12 inches above top of pipe.
 - c. Excavate without undercutting.
 - 2. Trench Depth:
 - a. Excavate to depth indicated on plans and sufficient to provide the minimum bedding requirements for the pipe being placed. If utility depth is not indicated on plans or profiles, the following depths shall be used as typical minimums from top-of-pipe to finish grade. If local codes require greater cover depths, the local code depth for the specific utility shall be used. Shallower depths may be use when required to match existing utilities at tie-ins or special conditions approved by the engineer.
 - b. Do not exceed depth indicated where conditions of bottom are satisfactory.
 - c. Increase depth as necessary to remove unsuitable supporting materials as directed.
 - 3. Trench Bottom:
 - a. Protect and maintain when suitable natural materials are encountered.
 - b. Remove rock fragments and materials when overexcavated. Payment shall be
 - negotiated with Owner for authorized replacement of unsuitable materials. Correct at

no additional cost to Owner when trench is overexcavated without authority or to stabilize bottom rendered unsuitable through negligence or improper operations.

- 4. Trench Width:
 - a. Excavate trench to a width, which will permit satisfactory jointing of the pipe and thorough tamping of bedding.
 - b. Unless indicated otherwise, do not exceed following trench widths:
 - 1) Below a plane 12 inches above top of pipe.

Nominal Pipe	Trench Width		
Size	Minimum	<u>Maximum</u>	
Less than 24 inches	Pipe OD + 1.50 foot	Pipe OD + 2 feet	
24 inches and larger	Pipe OD + 2 feet	Pipe OD + 3 feet	

- 2) Above plane defined in (1), as determined by Contractor means and methods.
- 3) Maximum trench width limitations shall apply in all areas more than 5 feet from manhole or structure walls.
- 4) Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods utilized.
- 5. Fill Areas: Perform trenching only after compacted fill has reached an elevation of not less than one foot above the top of the pipe.
- 6. Limit maximum length of open trench to 100 feet in advance and to 100 feet behind pipe installation.
- 7. Protect open trenches with movable concrete barriers, wood beam barricades, fencing or other approved method.

E. Dewatering:

- 1. Control grading around excavations to prevent surface water from flowing into excavations.
- 2. Drain or pump as required to continuously maintain all excavations and trenches free of water or mud from any source and discharge to approved drains or drainage channels. Commence when water first appears and continue until work is complete to the extent that no damage will result from hydrostatic pressure, flotation, or other causes.
- 3. Remove subgrade material rendered unsuitable by excessive wetting or siltation and replace with approved backfill material.

3.03 SUBGRADE PREPARATION

- A. General:
 - 1. Excavate or backfill as required to construct subgrades to the elevations and grades indicated.
 - 2. Remove all unsuitable material and replace with acceptable fill material. Perform all wetting, drying, shaping, and compacting required to prepare subgrade.
- B. Subgrade for Fills: Roughen by discing or scarifying and wet or dry top 6 inches as required to bond with fill.
- C. Subgrade for areas to receive crushed rock base course, pavement, structures and concrete slabs:
 - 1. Extend subgrade, where possible, the full width of the pavement, structure, or concrete slab, plus 1 foot in each direction.
 - 2. Scarify the top 6 inches of subgrades in excavation areas and recompact.
 - a. Compact cohesive and cohesionless soil subgrades to a minimum of 95% of maximum density at optimum moisture content as determined by ASTM D1557.
 - b. Moisture content for cohesive and cohesionless materials shall not be more than 2% above or 2% below optimum during compaction. Stricter limits may be required to meet specified density. Less restrictive limits may be used when specified density requirements are achieved.
- D. Subgrade for Structures:
 - 1. For subgrades in fill, compact to density specified for fill.

- 2. For normal subgrades, not constructed in fill, above the water table and not subject to saturation, compact subgrade as specified for fill.
- 3. For saturated subgrades in well draining soil near or below the water table, dewater soil and compact top 6 inches as specified for fill, but not less than the density of undisturbed soil at the same location and depth.
- 4. For saturated subgrades in poor draining soil near or below the water table, dewater soil and compact to density of undisturbed soil at the same location and depth. If soil shows signs of liquefying or compaction efforts cause soil to loose density or bearing capacity as compared to in-situ material, notify engineer and proceed as directed.

3.04 CRUSHED ROCK BASE AND SUBBASE

- A. Cold Weather Limitations:
 - 1. Base course construction shall be prohibited when atmospheric temperature is below 6°C (35°F).
 - 2. Do not place base course on frozen subgrade.
 - 3. Protect base course and subgrade in freezing weather and repair areas damaged by freezing, by reshaping, and recompacting.
- B. Placement and Compaction:
 - 1. Place material without segregation of sizes and spread from spreader boxes or moving vehicles equipped to spread material in layers of uniform thickness.
 - 2. Compact in layers no less than 3 inches or more than 7 inches thick.
 - 3. Roll to specified compaction requirements throughout full depth of layer with tamping rollers, power rollers, rubber-tired rollers, or combination.
 - 4. Shape and smooth by blading.
 - 5. Hand-tamp in places not accessible to rolling equipment.
 - 6. Aerate by blade graders, harrows, or other approved equipment when mixture is excessively moistened by rain.
- C. Degree of Compaction:
 - 1. Base compaction on weight per cubic foot of material passing 3/4-inch sieve and compact to at least 95% of maximum dry density at optimum moisture.
 - 2. Determine and control compaction in accordance with ASTM D1557.
- D. Smoothness Test:
 - 1. Surface shall show no deviation in excess of 3/8-inch in any 10 feet when tested with a 10-foot straightedge applied parallel with and at right angles to the centerlines of the paved area.
 - 2. Correct any deviation in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as directed by Engineer.
- E. Maintain finished base course in a condition satisfactory to Engineer until pavement is placed upon it.

3.05 FILL AND BACKFILL

- A. General Fill and Backfill:
 - 1. Construct to the depths, contours, and elevations indicated and as specified, using suitable approved material from excavation and borrow areas.
 - a. Place materials in lifts not exceeding 8 inches (compacted).
 - b. Place only on subgrades approved by the Engineer.
 - c. Do not place snow, ice or frozen earth in fill and do not place fill on a frozen surface.
 - d. Remove all debris from excavation prior to placement.
 - e. Compact cohesive and cohesionless soil to a minimum of 95% of maximum density at optimum moisture content as determined by ASTM D1557.
 - f. Moisture content shall not be more than 2% above or 2% below optimum during compaction. Stricter limits may be required to meet specified density. Less restrictive limits may be used when specified density requirements are achieved. Obtain compaction by the controlled movement of approved compaction equipment during

the placing and grading of layers.

- B. Backfilling: Backfill for structures and trenches shall be as specified for general fill and backfill with the following additional provisions.
 - 1. Structures:
 - a. Backfill only after concrete has attained 70% design strength.
 - b. Backfill adjacent to structures only after a significant portion of the structure has been built to resist the imposed load.
 - c. Perform backfilling simultaneously on all sides of structures.
 - d. Exercise extreme care in the use of heavy equipment in areas adjacent to structures. Equipment operated within 10 feet of any wall shall not exceed 20,000 pounds gross weight.
 - e. Material above a 45-degree plane intersecting the footing shall not include rock fragments incapable of passing a 2-inch screen, and no shale whether disintegrated or not.
 - f. Compact backfill in lifts not exceeding 6 inches (compacted).
 - 2. Trenches: Backfill for trenches shall be as specified for general fill and backfill and with the following additional provisions:
 - a. Complete promptly upon completion of pipe embedment and approval to proceed.
 - b. Use hand methods to a plane 12 inches above top of pipe.
 - c. Mechanical methods shall be acceptable where hand backfill is not required.
 - d. Compact backfill in lifts not exceeding 8 inches (compacted).
 - e. Until compacted depth over utility exceeds 3 feet, do not drop fill material over 5 feet.
 - 3. Compaction:
 - a. Compact soil to 95% of maximum density at optimum moisture content as determined by ASTM D1557.
 - b. Moisture content shall not be more than 2% above or 2% below optimum during compaction. Stricter limits may be required to meet specified density. Less restrictive limits may be used when specified density requirements are achieved.
- C. Pipe Bedding Material:
 - 1. Place pipe bedding as indicated using bedding material specified.
 - 2. Consolidation or compaction by flooding or jetting methods will not be permitted.
 - 3. Place pipe bedding material as follows:
 - a. With level bottom layer at proper grade to receive and uniformly support pipe barrel throughout its length. Compact and test compaction of minimum 6 inch bedding layer prior to placement of fuel pipe. Placement of pipe on bags or block prior to placement of supporting bedding and dumping of sand bedding around, under or on fuel pipe in uncontrolled and non-uniform piles or layers prior to or without compaction is not acceptable. Reasonable gaps may be left in the supporting sand bedding layer when necessary for construction of pipe joints or other pipe discontinuities. Supporting fuel line with bags in congested piping areas where multiple fuel lines, fittings, directional changes and other complications exist mayl be permitted on a limited basis only when approved. Submit plan for approval when bag support is required.
 - b. Following placement of the fuel pipe, add second layer not exceeding 8 inches loose simultaneously to both sides of the pipe with care to avoid displacement of the pipe.
 - c. Continue placement and compaction of sand bedding in 8 inch lifts until a minimum of 12 inches of sand bedding is placed above the top of pipe.
 - d. Complete promptly after placement of pipe.
 - 4. Compact Pipe Bedding Material as follows:
 - a. In lifts not exceeding 8 inches of loose material.
 - b. Rod, spade, or use pneumatic or vibratory equipment.
 - 1) Throughout depth of embedment.
 - 2) Except sand bedding adjacent to or above coated steel fuel pipe, as required to obtain not less than 95% of maximum density as determined by ASTM D1557.
- D. Flowable Fill:

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- 1. Place in trench after pipe or structure is installed and approved for backfill.
- 2. Place in manner that prevents lateral or vertical displacement of pipe or structures. Pipelines with exterior protective coating or which are protected by a cathodic protection system shall not be restrained by straps or wires which will damage coatings or concentrate corrosion.
- 3. Material shall be placed within 2 hours of mixing with water. Placement shall conform to ACI and other typical procedures and practices used to place concrete, including Cold and Hot whether practices.
- 4. Backfill may proceed on top of flowable fill after it is sufficiently set to support foot traffic without deformation.

3.06 SITE GRADING, SURFACE TOLERANCE

- A. Excavate, fill, compact fill, and rough-grade to bring Project area to subgrades as follows:
 - 1. For paved surface areas; to underside of respective surfacing or base course.
 - 2. For seeded and landscaped areas; to a minimum of 4 inches below finished grade.
- B. Finish Grading and Surface Tolerances
 - 1. Grade and compact all areas within the project area, including excavated and filled sections and adjacent transition areas, reasonably smooth, and free from irregular surface changes.
 - 2. Degree of finish shall be that ordinarily obtained from blade grader except as otherwise specified.
 - 3. Finished subgrades which receive pavement shall not be more than 0.04-foot above or below subgrade elevations indicated.
 - 4. Finished grades in unpaved areas shall not be more than 0.10-foot above or below those indicated.
 - 5. Test all areas to receive pavement with 10-foot straightedge applied parallel and perpendicular to centerline. Deviation shall not exceed 0.04-foot.
 - 6. Finish all areas of the project, including ditches and swales to drain readily. Water shall not pond on any part of the project when grading is completed except in areas specifically designed by the engineer for slowing or retaining storm runoff.
 - 7. Unless shown, noted or directed otherwise, grades adjacent to paved areas such as sidewalks, slabs, roadways and aprons shall generally be 0.10 to 0.20 foot below the adjacent edges of the paved area and slope away from the pavement at 2% to 5%. Finished grade that causes water to pond on or near the paved areas is unacceptable.
 - 8. Provide rounding at top and bottom of banks and at other breaks in grade.
 - 9. Material: Use the most suitable material obtained from excavation and stripping operations and borrow when required.
 - 10. Clear areas free of vegetation, rock, and other materials which would interfere with grading.

3.07 WASTE MATERIALS

- A. Remove unsuitable materials from Work area as excavated.
- B. Demolished or excavated materials such as asphalt, concrete, and others which are unsuitable for reuse in the Project (as determined by the Engineer) shall become property of Contractor and be disposed of off-site at locations arranged for and paid for by the Contractor (designated on-site by Owner).
- C. Contaminated materials are expected for existing tank farm areas. If Contractor suspects contaminated soil has been encountered during the progress of Work by odor or other means, he shall notify the Owner immediately for directions on how to proceed. The Contractor shall dispose of material at a location and price approved by the Owner.
- D. If encountered, contaminated soils shall be disposed of as specified in Section 02 61 00.00 Excavation and Handling of Contaminated Materials.
- E. Place excavated rock in interior of waste area fills so it will not be exposed to view.
- F. Grade waste areas and leave free-draining with an orderly, neat appearance.

3.08 GEOTEXTILES

- A. Install in accordance with manufacturers recommendations on approved subgrades and as specified herein.
- B. Supply material in widths required to minimize seams and laps.
- C. Secure material in place on slopes, trench walls and other surfaces where needed to prevent displacement by wind or construction operations. Use pins recommended or supplied by fabric manufacturer.
- D. Subgrades shall be free of sharp objects or debris.
- E. Fabric used for segregation and drainage such as in trenches, around tanks and under slope protection shall have a minimum of 6 inches of overlap. Fabric use for reinforcement under pavement shall have a minimum of 18 inches of overlap unless otherwise recommended by the fabric manufacturer.

3.09 ON-SITE TESTING

- A. Owner shall retain and compensate an independent and qualified testing lab to perform the following tests. Where indicated on drawings or specified for test to be performed by a Geotechnical Engineer, tests may be performed by a qualified testing laboratory. However, if needed or required for work to proceed, any geotechnical interpretations or design recommendations based on the testing must come from a Geotechnical Engineer. Owner shall provide testing laboratory access to work which is to be tested and include in his bid, all costs for delays associated with the performance of the described testing by the owner's testing lab. Contractor is responsible for notifying the Owner's Representative no less than 24 hours before work is expected to be ready for testing.
- B. The method of in-place compaction testing including density and moisture content will be as follows:
 - 1. Density: ASTM D6938-10 (Nuclear Density) and ASTM D1556 (Sand Cone Density).
 - 2. Moisture Content: ASTM D6938-10 (Nuclear Moisture).
- C. A representative frequency of in-place compaction tests including density and moisture content shall be as follow:
 - 1. At least one test per lift for every 100 linear feet or less of backfill placed in trenches.
 - 2. At least one test for every 500 square feet where subgrade preparation for paved areas is being performed.
 - 3. At least one test for every 200 square feet but not less than one test per lift in fill around structures and tanks.
 - 4. At least one test when the Engineer suspects the moisture content or effectiveness of compaction is not acceptable.
 - 5. In place density may be tested by ASTM D6838-10 (nuclear) or by ASTM D1556 (sand cone), but at least one ASTM D1556 test shall be performed for every 10 ASTM D6838-10 tests or portion thereof.
 - 6. At least one DCP (Dynamic Cone Penetrometer) test in accordance with ASTM D6951/D6951M to verify soil bearing capacity below each building or significant concrete structure footing or foundation. If not indicated or directed otherwise, test subgrade and consider each structure weighing or to be loaded in excess 5000 pounds as significant.
- D. Fill failing to meet required densities or moisture contents shall be scarified and recompacted as necessary to achieve specified results at no additional cost to Owner.
- E. Removal of in-place material and replacement with approved new material will be required if scarifying and recompaction do not produce the required densities.
- F. Perform at least one ASTM D2487 (Classification of Soil) and one ASTM D1557 (Compaction) test on each soil type supporting pavement or structures, or used in fill or backfill operations during construction.
 - 1. Each sample shall be taken from subgrade material for structures and pavement, trenches or other excavations as directed by the Engineer and should be generally representative

of distinguishably differing materials encountered and used (existing or placed) for subgrades, backfill or fill.

- 2. Perform one set of tests at the beginning of excavation and one additional set of tests when material properties vary (wetter, dryer, more granular, or other conditions) from the material initially tested.
- 3. Additional tests shall be performed when directed by the Engineer.
- G. Perform at least one ASTM D1557 (Compaction) test for every 2500 cubic yards of material placed.
- H. Flowable Fill (CLSM):
 - 1. Make and test one set of four cylinder specimens in accordance with ASTM D4832 for every 100 cubic yards of material placed but not less than one set for each day's pour.
 - 2. For each set of cylinders made, perform one test for flowability of the material in accordance with ASTM D6130. The material shall form a patty with an average diameter of at least 8 inches, without segregation of constituents in the mixture.

3.10 RIPRAP

- A. Foundation Preparation:
 - 1. Trim and dress areas requiring riprap to conform to lines as indicated within an allowable tolerance of ±3 inches from the theoretical slope lines and grades.
 - 2. Fill area below riprap limit with suitable material and compact.
 - 3. Do not place riprap until the base as been accepted.

B. Placement:

- 1. Place stones to full course thickness in one operation and in a manner to avoid displacing the underlying material.
- 2. Place stone on the prepared base to produce a reasonably well-graded mass of stone in close contact and with a minimum of voids.
- 3. Place within a tolerance of ±3 inches from the theoretical slope lines and grades.
- 4. Maintain the riprap protection until accepted; replace any material displaced.

3.11 MAINTENANCE AND CLEANUP

- A. Protect newly graded areas from actions of the elements.
- B. Settling or erosion occurring shall be filled and repaired and grades reestablished to the required elevations and slopes.
- C. Keep paved areas clean. Promptly remove rock or dirt dropped upon paved surfaces by sweeping, washing, or other methods acceptable to the Engineer.

END OF SECTION

SECTION 321373.16

FIELD MOLDED JOINT SEALANTS FOR CONCRETE PAVEMENTS FOR FUELING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes preparation of joints in Portland cement concrete pavement and the installation of field molded sealant material subject to intermittent fuel product exposure, installed in accordance with this specification section and the material manufacturers recommendations. Work performed under this section is being performed in conjunction with the construction of aircraft aprons, fuel tanker parking, fuel storage and dispensing, or other facilities related to the storage, distribution and handling of commercial/civil Jet-A, Mogas and Avgas fuel products. All products installed and work performed under this section shall be done using products, equipment and procedures that are safe and compatible with the stated fuel products and intended facility functions. This section also includes miscellaneous spall repair associated with and necessary to perform proper joint sealant installation performed under this section.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. D1751-04 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - 2. D1752-04a Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
 - 3. D5893 Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
- B. U.S. Army Corps of Engineers (USACE):
 - 1. 29 CFR Part 1926-07 Safety and Health Regulations for Construction.

1.03 SUBMITTALS

- A. Submit as specified in 013300 Compliance Submittals .
- B. Product Data
 - 1. Sealant manufactures material data literature.
 - 2. Manufacturer certification letter stating that the sealant and other system products supplied by them for the project are recommended by them or acceptable for the specific project application, conditions and exposures.
 - 3. Manufacturer's product quality control test reports showing the product date of manufacture, product name and number, lot number, testing standard(s), standard test property requirements, and tested material property results.
 - 4. Brochures and instructions for installation equipment and operation.
 - 5. Installer qualifications documentation and statements

1.04 QUALITY ASSURANCE

- A. Tests of all Contractor-secured materials and products being submitted for approval and necessary to determine conformance with all requirements of these specifications shall be performed by an independent testing laboratory retained and compensated by the Contractor unless otherwise specified.
- B. Material Test Requirements:
 - 1. The Contractor shall furnish the specified, indicated and required quantities of materials to the testing laboratory and Owner as necessary to complete all submittal, testing and quality assurance requirements of this specification Section.
 - 2. No material provided under this specification Section shall be used or installed prior to receipt of the Engineer's approval of all tests and material submittal requirements, including manufacture recommendations, material data, installation equipment data, material test reports and material samples.

- 3. Manufacturer test reports and certification letters of lot/material conformance with the applicable specified ASTM standards is acceptable in lieu of the specified Contractor material testing. Test information must be complete and representative of all material(s) actually being installed in the project.
- C. Installer Qualifications
 - 1. Contractor must provide documentation demonstrating that the company and personnel installing the seal material has the experience, training and skills necessary to properly install the seal materials in accordance with this specification Section and the manufacturer's recommendations. To this end, the Contractor must provide documentation that the installing company and personnel being assigned to the project have at least 2 years of experience installing the quantities and types of sealant materials required for this project and furnish a list of projects that the installing personnel have successfully completed during that time period.
- D. Manufacture's Technical Representative Services
 - 1. The Contractor shall procure the services of the sealant and other product manufacturer's technical representatives at the beginning of the joint preparation and sealant installation process to insure that joint preparation and sealant installation proceeds properly and is done in accordance with the manufactures recommended practice. On-site technical representative services shall be provided for no less than one day and continue until the installing personnel have demonstrated that they understand and are capable of using the installation equipment properly and following the manufactures recommended installation recommendations.
- E. PROJECT/SITE CONDITIONS
 - 1. Disposition of Utilities:
 - a. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.
 - b. Provide a minimum 48-hours'notice to the Engineer and receive written notice to proceed before interrupting any utility.
 - 2. Water and other on-site utilities shall be obtained, provided and paid for as specified in Division 1.
- F. DELIVERY AND STORAGE
 - 1. Materials delivered to the jobsite shall be inspected for defects, unloaded and stored in structures or facilities capable of protecting the materials from exposure to weather and keeping them within temperature and other conditions recommended by the manufacturer.
- G. DUST, SEDIMENT AND DEBRIS CONTROL
 - 1. Provide temporary dust and debris controls as required or directed by the Owner to control dust or other objectionable conditions resulting from pavement saw cutting and sealant installation.

PART 2 - MATERIALS

2.01 FIELD MOLDED SEALANT

A. Where conventional sealant material is indicated, sealant material shall be self-leveling Jet Fuel resistant Silicone such as Sikasil-728 SL or approved substitute conforming to ASTM D5893. Color shall be gray.

2.02 BOND BREAKING TAPES

A. Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, nonabsorbing, non-staining and non-reacting adhesive-backed tape. The bond breaker tape shall be approximately equal to the width of the joint and shall not bond to the joint sealant.

2.03 EQUIPMENT

- A. General
 - 1. Machines, tools, and equipment used in the performance of work required by this specification section shall be approved before the work is started and shall be maintained

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in satisfactory condition at all times during the performance of this contract.

- B. Concrete Saw(s)
 - 1. A self-propelled power saw with water-cooled diamond saw blades shall be used for cutting, widening and deepening joints to the depths and widths specified, indicated or directed, including removal of existing joint filler materials, old joint sealant and other materials within or adhered to the joint wall face of the joints to be sealed.
- C. Water Blasting Equipment
 - 1. Water blasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, a wand with safety release cutoff controls, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary water resupply equipment shall be of sufficient capacity to permit a continuous cleaning operation at a minimum pressure of 2500 psi gage. The pumps, hoses, wand, and nozzle shall be of sufficient capacity to permit the cleaning of both walls of the joint and the pavement surface for a width of at least ½ inch on either side of the joint. A pressure gauge mounted at the pump shall show the pressure in psi at which the equipment is operating at all times. The Contractor may be directed or required to provide and use differing pressure washing equipment if joints are being damaged or not being properly cleaned at the specified pressure.
- D. Cold Sealant Installation Equipment
 - 1. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e. caulking guns) may be used for small applications. The machine shall at all times be operated by an experienced operator.
- E. Sandblasting Equipment
 - 1. Sandblasting equipment shall include an air compressor, hose, a long-wearing venturitype nozzle of proper size, shape, and opening, and a dry sand pot/vessel. The maximum nozzle opening shall not exceed 1/4 inch. The air compressor shall be portable and shall be capable of furnishing not less than 150 cubic feet per minute and maintaining a line pressure of not less than 90 psi at the nozzle during continual use. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle in the proper position to clean spall areas for repair or joints when necessary to clean or prepare joints. Prep sand blasting of all spall areas is required but prep sand blasting of most or all joints for sealants is not. The height, angle of inclination, and the size of the nozzle shall be adjusted as necessary to ensure satisfactory results.
- F. Hand Tools
 - 1. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

2.04 EPOXY-RESIN GROUT

A. Epoxy-resin grout shall be an approved epoxy grout material system having a documented installed performance history record of at least 5 years under exposure conditions similar to this project and be specifically recommended/approved by the manufacturer for the spall conditions being repair under this contract. The grout material shall be Five-Star DP or HP Epoxy Grout or approved substitute having equal or greater compressive strength, bond strength, UV and chemical resistance, and other performance properties. Color shall be concrete gray.

2.05 PRE-MOLDED JOINT FILLER

A. Pre-molded joint filler for expansion joints shall conform to the requirements of ASTM D1751 or D1752 and shall be punched to admit the dowels where dowels are called for on the plans. The

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filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer. Removable edge strips acceptable to the Engineer may be used for forming the groove for sealant above expansion joints, and must be used in locations where saw cutting is not possible.

PART 3 - EXECUTION

3.01 JOINT PREPARATION

- A. Saw Cutting & Grooving New Pavement
 - 1. Expansion, contraction and construction joints in new pavement shall be saw cut to the dimensions shown on the contract drawings for each joint type indicated on the contract drawings and as specified in Section 32 13 13.00 Portland Cement Concrete Pavement.
- B. Saw Cutting, Grooving and Re-grooving Existing Pavement Joints
 - 1. Seals and sealants in existing pavement shall be carefully removed to the limits indicated. Joints in existing pavement shall then be saw cut to the dimensions shown on the contract drawings or those recommended by the sealant manufacturer for each joint type and size. Contractor shall only use tools and methods that do not unacceptably or irreparably damage the existing pavement, joint faces, corners or edges. The Contractor shall not use any tools, methods or procedure that damage the pavement joints or create any conditions that impair or prevent proper operation of the sealant. Existing sealant material may be saw cut or removed using other methods acceptable to the Engineer that does not damage the pavement joint or impair the new sealant operation or performance in any way.
- C. Joint Cleaning
 - 1. Immediately following the sawing operation, the joint faces and grooves shall be thoroughly cleaned with water using a high pressure washer capable of removing all saw cuttings and debris from the joint. A multiple pass pressure wash technique shall be used until the surfaces are free of dust, dirt, curing compounds, or any substance that will or might prevent proper insertion, uniform sealant contact and proper bonding of the sealant to the concrete joint face. Pressure wash cleaning of joints shall be limited to the length of joints that can be sealed during the same workday.
 - 2. Immediately following pressure washing, the joints shall be cleaned with dry compressed air using a nozzle to help dry the joints and remove any remaining water and contaminates. Joints shall then be allowed to dry prior to installing the sealant.

3.02 TRIAL/DEMONSTRATION INSTALLATION

A. Prior to the cleaning and sealing of joints for the entire project, a test section at least 200 feet long for each type of joint shall be prepared and sealed at a designated location in the project pavement, using the specified materials and the approved equipment to demonstrate the proposed joint preparation and sealing methods, materials and equipment will function properly and achieve an acceptable end product. The Owner's Representative shall be given a minimum of 24 hours advanced notice of the test seal installation operation and provided ample opportunity to observe the cleaning and installation processes. Following completion of the trial installation and before any other joints are sealed, the trials joints will be inspected by the Owner's Representative to determine that the materials and installation meet the requirements specified. If materials or installation do not meet requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Owner. No other joints shall be sealed until the test installation has been approved. If the trial section is approved, it may be incorporated into the permanent work. Remaining joints shall be sealed in the same manner as the approved test seal installation procedure.

3.03 SEAL INSTALLATION

A. Properly cut, cleaned and prepared joints shall be sealed as quickly as possible to prevent intrusion of dirt and debris that might adversely affect the sealant seating and performance. Any

prepared and unsealed joints that become dirty or similarly compromised due to wind, rain or other conditions shall be recleaned prior to installation of the joint seal.

B. Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/8 inch below the pavement surface, plus or minus 1/16 inch. Remove and discard excess or spilled sealant from the pavement by approved methods. Install sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Owner's Representative. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.04 EXPANSION JOINTS

A. Expansion joints shall be installed as shown on the plans. The pre-molded filler of the thickness shown on the plans shall extend for the full depth and width of the slab at the joint, except for space required at the top of the slab joint for the joint sealant. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A removable groove form strip or assemblage shall be used to form the seal groove space above the filler material in joints adjacent to walls and structures that preclude conventional saw cutting methods. A removable groove form strip may also be used at locations accessible to conventional saw cutting. When the Contractor elects to install full depth joint filler in locations accessible to conventional sawing and saw cut the groove for the joint seal, the Contractor must cut the seal groove wide enough to properly dress the groove faces on both sides of the joint and provide a wider joint seal material as necessary to properly seal the wider cut.

3.05 WEATHER AND TEMPERATURE CONDITIONS

- A. Sealant material installation, joint preparation and other work directly or potentially affecting the quality of the seal installation or the short or long term seal performance shall not be performed during cold, rainy or inclement weather conditions.
- B. Pavement and air temperatures at the time of saw cutting shall be no less than 45 degrees F and no more than 80 degrees F. Pavement and air temperatures at the time of seal installation shall be no less than 50 degrees F and no more than 80 degrees F. Other temperature limits may be required or permitted if recommended by the sealant manufacturer(s).

3.06 IRREGULAR JOINTS AND CRACKS

- A. Joint resealing projects may have a number of existing locations where pavement movement, spalling or other conditions have resulted in joint seal problems that do not conform to the standard joint conditions specified, indicated, or applicable to the majority of the project. Irregular joints are defined as all joints that do not conform to the indicated joint cross sections or the seal material performance limits of an indicated or specified joint type. When encountered, the Contractor shall use alternate seal material, equipment and installation procedures necessary to properly prepare the irregular joints and seal them with a functional and appropriate sealant material section. Irregular joint seal work will typically require a wider and/or deeper saw cut to provide a uniform joint cross section and seal seating face, and matching sealant material having the appropriate performance range for the irregular joint condition. If listed in the Bid Form, the Contractor shall provide a unit price for the specified quantity of Irregular Joint Seals that includes all costs related to joint preparation and seal installation for irregular joints. If not specifically listed in the bid form, any required irregular joint repairs shall be considered to be incidental to other work and included in the unit or lump sum price for other work.
- B. Grooving, repair and/or sealing of previously unsealed random pavement panel cracks are not classified as spalls and are not included in the scope of this project. Breakage lines and limits of joint spalls as defined and used in this specification shall have an exposed surface area of less than 1 square foot and generally have crack lines that enter and exit the same joint line,

but may intersect an intersecting joint line close by.

3.07 SPALL REPAIR

- A. Joint spalls encountered during the joint cleaning and preparation work shall be addressed using one of the following procedures.
 - 1. Small spalls completely removed by the saw cutting process or that don't result in installed seal expansion of more than 85% of the seal materials published upper expansion limit (applicable maximum joint width) require no special action.
 - 2. Small, loose material spalls that do, or will result in expansion of more than 85% of the seal materials published upper expansion limit when the joint is cleaned and the spalled material is removed, shall be repaired by removing the spall, thoroughly cleaning the spall area (including localized sand blasting to provide proper bond), and filling the dried spall space with an approved gray concrete colored non-shrink epoxy patching material prior to saw cutting and preparation of the groove for sealing. Following installation and setting of the epoxy material, the joint groove shall be cut and the indicated joint sealant installed as specified and indicated for the applicable sealant installations.
 - 3. Larger spalls whose removal would be very difficult, require additional pavement removal or result in damage to the surrounding pavement and/or joints shall be repaired by pressure washing the visible crack, cleaning and drying with compressed air, and injection of gray, concrete colored epoxy material prior to saw cutting, joint preparation or sealing of the adjacent joint. Following repair of the spall and curing of the epoxy, the adjacent joint shall be saw cut and sealed as specified and indicated for the applicable sealant installation.

3.08 FIELD QUALITY CONTROL

- A. Application Equipment
 - 1. Inspect the application equipment to ensure conformance to temperature requirements and proper installation. Evidences of bubbling, improper installation, failure to cure or set will be cause to suspend operations until causes of the deficiencies are determined and corrected.
- B. Procedures
 - 1. Quality control procedures shall be maintained throughout the cleaning and joint installation process to prevent improper equipment operation and cleaning techniques that damage the concrete in any manner. Any equipment use, procedure, or other action causing damage to the pavement shall be stopped immediately and corrective action taken.
- C. Temperature
 - 1. The pavement temperature shall be determined by placing a thermometer in the initial saw cut for sawing and the cleaned joint for sealing. The thermometer shall remain in the joint for an adequate time to acclimate and provide an accurate control reading. The measured temperature reading shall then be recorded in degrees F, along with the date, time an approximate reading location description.

3.09 MEASUREMENT AND PAYMENT

- A. Measurement for Unit Price Contracts: Units shall be measured in the English system measurement of feet of completed sealed joint and shall include all materials, equipment, utilizes, services, labor and all other items necessary to cut, recut, wash, clean, seal and otherwise complete all work specified herein.
- B. Measurement for Lump Sum Contracts: Units shall be measured in the English system measurement of feet of completed sealed joint and shall include all materials, equipment, utilizes, services, labor and all other items necessary to cut, recut, wash, clean, seal and otherwise complete all work specified herein. Measurement will be for purposes of progress payment only.
- C. Payment for Unit Price Contracts: Payment shall be made for completed and accepted units in feet of joints sealed in accordance with this section as listed in the Bid Form Unit Prices.

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D. Payment for Lump Sum Contracts: Payment shall be made for completed and accepted units in feet of joints sealed in accordance with this section as a percentage of the total work.

3.10 PRODUCT ACCEPTANCE

A. The completed joint sealant system shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted and replaced as specified herein at no additional cost to the Owner.

3.11 MAINTENANCE AND CLEANUP

A. Upon completion of the sealing and other project work, all unused materials shall be removed from the site along with any sealant on the pavement. Pavement shall be left in clean condition.

END OF SECTION

SECTION 334100.02 CONTAINMENT DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY:

- A. This work includes furnishing and installing containment drainage pipe and appurtenances, manholes and inlet structures, as shown on the drawings and as specified.
- B. Related Work Specified Elsewhere:
 - 1. Site Preparation and Earthwork: SECTION 31 00 00.00.
 - 2. Concrete: DIVISION 3

1.02 REFERENCES

- A. Applicable Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. A48-12 Gray Iron Castings.
 - b. C443-12 Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - c. C478-13 Precast Reinforced Concrete Manhole Sections.
 - d. C920-11 Elastomeric Joint Sealants.
 - e. American Water Works Association (AWWA):
 - 1) C104/A21.4 (2013) Cement–Mortar Lining for Ductile Iron Pipe and Fittings for Water.
 - 2) C105/A21.5 (2010) Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3) C110/A21.10 (2012) Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches, for Water and Other Liquids.
 - 4) C111/A21.11 (2012) Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5) C115/A21.15 (2011) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 6) C150-08 Thickness Design of Ductile-Iron Pipe.
 - 7) C151/A21.51 (2009) Ductile-Iron Pipe, Centrifugally Cast.
 - 8) C153/A21.53 (2011) Ductile-Iron Compact Fittings.
 - 9) C219-11 Bolted, Sleeve-Type Couplings for Plain-End Pipe.
 - 10) C550-13 Protective Interior Coatings for Valves and Hydrants.
 - 11) C600 (2010) Installation of Ductile Iron Water Mains and Their Appurtenances.

1.03 SUBMITTALS:

- A. Product Data
 - 1. Pipe and pipe materials
 - 2. Pipe fittings
 - 3. Pipe connections
 - 4. Cast-in-place concrete structure
 - 5. Castings

1.04 QUALITY ASSURANCE

- A. Utility Compliance: Comply with regulations pertaining to stormwater drainage systems. Include standards of water and other utilities where appropriate.
- B. Product Options: Drawings indicate sizes, profiles, connections and dimensional requirements of system components. Other products with equal performance characteristics may be considered.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect pipe, fittings and seals from dirt and damage.
- B. Handle pre-cast concrete manholes and other structures according to manufacturer's rigging instructions.

1.06 PROJECT CONDITIONS

- A. Site Information: Perform site investigation, research utility records and verify existing utility locations.
- B. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Authority or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 - 1. Notify Owner not less than 72 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without receiving written permission.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate with all other utility work.

PART 2 - PRODUCTS

2.01 CONCRETE:

A. Conform to applicable requirements of Section 03 30 00.00.

2.02 CONCRETE MANHOLES AND STRUCTURES

- A. Cast in place and Structures:
 - 1. Structures shall conform to all applicable requirements of Section 03 30 00.00 and be designed to support (AASHTO H-20 or HS-20, AASHTO M-306, or Aircraft) loading
 - 2. Steps will be polypropylene coated steel conforming to ASTM C478.
 - 3. Interior joints shall be sealed with a jet fuel resistant sealer material.
 - 4. Joint sealant shall be Tremco THC-901 joint sealant or approved equal.

2.03 CONCRETE WATERPROOFING ADDITIVE FOR CONTAINMENT STRUCTURES:

A. Concrete fuel pits and vaults, containment basins, containment drain inlets, containment manholes, lift stations and other structures, excluding dike walls, which will routinely be exposed to and/or intended to contain and/or convey fuel or fuel impacted storm water shall be constructed using concrete as specified in Section 03 30 00.00 - Cast-in-place Concrete containing Xypex Admix C-1000. Xypex additive shall also be used when containment structures are precast.

2.04 IRON CASTINGS:

- A. Conform to ASTM A48 Class 35B or stronger Gray Irion, or ASTM A536 Grade 80-55-06 or stronger ductile iron of the type and size specified and indicated.
- B. Containment drain inlet frames and grates within dike areas having no vehicle access shall be light duty R-1879-A9G, as manufactured by Neenah Foundry Company, or approved equal.
- C. Cast containment inlet drain/grate assemblies for use in truck stand, pump pads and similar locations indicated shall be heavy-duty R-4003 Type A or B, as manufactured by Neenah Foundry Company, or approved substitute.
- D. Circular containment manhole covers and frames shall be heavy-duty R-1736, as manufactured by Neenah Foundry Company, or approved substitute.

2.05 DUCTILE IRON PIPE:

- A. Design and Manufacture of Pipe:
 - 1. All piping for secondary containment shall be thickness Class 51 or greater ductile iron pipe conforming to AWWA C151.
- B. Joints:
 - 1. Joints may be mechanical or push-on type. Use of flanged joints is only permitted above grade or inside structures where they can be visually inspected and monitored after construction.
 - 2. Mechanical Joints:
 - a. Joints shall conform to AWWA C111.
 - b. Ductile iron glands, high strength steel bolts, steel nuts and nitrile rubber or Viton gaskets conforming to AWWA C111.

- 3. Flanged Joints:
 - a. Provide flanged joints for exposed pipe only where specified or indicated.
 - Flanges for pipe shall be ductile iron and conform to the applicable provisions of AWWA C110 (ANSI A21.10) and C115 (ANSI A21.15) and shall be drilled per ANSI B16.1 Class 125 (with raised face).
 - c. Gaskets shall be Viton or other material compatible with Jet-A and other fuel products stored with the project containment area, and rated for a working pressure of not less than 50 psi.
- 4. Push-on Joints:
 - a. Fuel resistant nitrile rubber or Viton gaskets and lubricant conforming to AWWA C111.
- 5. If the project includes a containment drain system lift station or pumped oil/water separator discharger, all joints in the containment force main piping shall be mechanically restrained using Megalug as manufactured by EBAA Iron Inc. or similar joint restraining devices acceptable to the Engineer.
- C. Fittings:
 - 1. Fittings shall conform to AWWA C110 (ANSI A21.10) (normal fittings) or AWWA C153 (Compact fittings) and shall have a pressure rating of not less than that specified for pipe.
 - 2. Fittings shall be ductile iron.
 - 3. Fittings for pipe with mechanical joint shall also have mechanical joints.
 - 4. Include all specials, taps, plugs, flanges and wall fittings as required.
- D. Pipe Sleeve Couplings:
 - 1. Sleeve: ASTM A126, Class B, gray iron.
 - 2. Followers: ASTM A47, Grade 32510, or ASTM A536 ductile iron.
 - 3. Gaskets: Fuel resistant nitrile rubber or Viton conforming to AWWA C111.
 - 4. Bolts and Nuts: Steel conforming to AWWA C111
 - 5. Paint: Enamel
- E. Interior Pipe Lining:
 - 1. All pipe and fittings shall be cement-mortar lined and seal coated in accordance with AWWA C104.
- F. Exterior Pipe Coating:
 - 1. Provide exterior asphalt coating conforming to AWWA C151.
- G. Poly Bagging
 - 1. Bag all ductile iron pipe and fittings using bagging material conforming to AWWA C105.

2.06 TRACER WIRE:

A. Install tracer wire, test stations and grounds as indicated on the project drawings and specified in Section 31 00 00.00 – Site Preparation and Earthwork for Fueling.

PART 3 - EXECUTION

3.01 TRENCHING AND BACKFILLING:

A. Perform trenching and backfilling as specified in SECTION 31 00 00.00.

3.02 PIPE INSTALLATION:

- A. All pipes shall be carefully laid true to lines and grades indicated. Any pipe which is not in true alignment or which shows undue settlement after laying, shall be taken up and re-laid at the Contractor's expense.
- B. Install to conform to manufacturer's recommendations.
- C. Do not drag over gravel or rock. Avoid striking rocks or hard objects when lowering into trench.
 - 1. Pipe and accessories shall be handled so as to ensure delivery to the trench in sound, undamaged condition.
 - 2. Pipe shall be carried into position and not dragged.

- 3. Pipe and accessories interior shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method.
- 4. Before installation, the pipe shall be inspected for defects. Material found to be defective, before or after laying, shall be replaced with sound material without additional expense to the Owner.
- 5. Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the pipe materials be dropped or dumped into the trench.
- 6. Except where necessary in making connections with other lines, pipe shall be laid with the bells facing in the direction of laying.
- 7. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate joints.
- 8. Pipe that has the grade or joint disturbed after laying shall be taken up and re-laid.
- 9. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until jointing is completed.
- 10. When work is not in progress, between phases, and at the end of each working day, open ends of pipe, fittings and valves shall be securely capped so that no trench water, earth, or other substance will enter the pipes or fittings.

3.03 DRAINAGE STRUCTURES:

- A. Reinforced Portland cement Concrete:
 - 1. All reinforced Portland cement concrete drainage structures shall have a paved invert and a smooth grade from pipe invert to pipe invert in structures having more than one pipe or catch basin sump as indicated.
 - 2. Cast-in-Place: Conform to all applicable requirements of DIVISION 3.
- B. Waterproofing:
 - 1. Construct structures using Xypex waterproofing admixture as specified in products.
- C. Casting:
 - 1. Install all castings as indicated.
 - 2. Install manhole steps at 12 inches oc vertical.

3.04 ACCEPTANCE TESTS:

- A. Alignment of New Piping:
 - 1. Piping shall be inspected by flashing a light between changes in alignment.
 - 2. Contractor shall clean pipe of excess joint lubricant and other dirt and debris prior to inspection.
 - 3. Determine from illumination and/or physical inspection:
 - a. Presence of any misaligned, displaced or broken pipe
 - b. Presence of visible infiltration or other defects
 - 4. Correct defects as required prior to conducting leakage tests.
- B. Leakage Tests:
 - 1. The piping systems shall be field-tested as follows:

Piping System	Type of Test	Test Pressure	Duration of Test (HRS)	Allowable Leakage
New Gravity Lines	Hydrostatic	5 psi	2	0

- 2. Contractor shall furnish all water and all testing equipment, as required to perform leakage testing of piping systems.
- 3. Contractor shall obtain approval of equipment and acceptance of methods proposed for use.

- 4. Protect manholes and other structures by means of bulkheads to prevent bursting pressures from being applied inside the structure.
- 5. Hydrostatic testing shall be performed as follows:
 - a. After the pipe is laid, the joints completed and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping shall, unless otherwise specified, be subjected to a hydrostatic pressure test.
 - b. Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.
 - c. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.
 - d. Apply in such a manner that the required pressure can be obtained and maintained for the duration of the tests.
 - e. Exposed pipe, joints and fittings shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary.
 - f. Cracked or defective pipe, joints or fittings discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory.
 - g. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.
 - Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe to maintain pressure within 1 psi (7 MPa) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
 - i. After satisfactory completion of the hydrostatic test, drain the entire system tested for all test water by a method, and in a location, approved by the Engineer.

END OF SECTION

SECTION 335243.00 FUEL SYSTEM GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY:

- A. Work in this section includes furnishing all materials, labor and supervision necessary for the construction of the new Jet Fuel and Avgas storage and distribution system The work shall include all pipe, fittings, valves, tanks, appurtenances, pumps, filters, meters, dispensers, and activities as specified herein and shown on the drawings. All testing, inspection and flushing shall be provided as specified to provide a complete and operational system.
- B. The General Provisions described herein, together with the General Conditions, Special Provisions and Division 1 of the contract, apply to the work in Division 33 52 43 – Aviation Fuel Distribution. This Section is hereby made a part of all other Sections of Division 33 52 43 - Fuel System Work, as if repeated in each.
- C. All permits and licenses that are required by governing authorities for the performance of work shall be procured and paid for by the Contractor.
- D. The work will be completed during normal operating hours and conditions unless otherwise specified. Staging of construction activities is required.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.11 Fuel System Piping Specialties
- C. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- D. Section 335243.15 Fuel System General Valves
- E. Section 335243.16 Aviation Fuel Control Valves
- F. Section 335243.21 Fuel System Metering Equipment
- G. Section 335243.23 Fuel System Pumps
- H. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- I. Section 335243.28 Fuel System Filtration
- J. Section 335243.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems
- K. Section 335643.15 Fuel System Aboveground Horizontal Tanks
- L. Section 33 56 43.17 Factory-Assembled Aboveground Storage Tank System

1.03 REFERENCES:

- A. Refer to each individual section in this division for a list of applicable references from each of the following organizations:
 - 1. American Petroleum Institute (API):
 - 2. National Fire Protection Association (NFPA):
 - 3. Underwriters Laboratories (UL):
 - American Society of Mechanical Engineers (ASME):
 a. B31.3 Process Piping
 - 5. American Society for Testing and Materials (ASTM):
 - 6. American National Standards Institute (ANSI):
 - 7. Factory Mutual Engineering Division (FM):
 - 8. Industrial Risk Insurance (IRI):
 - 9. Military Specifications (Mil):
 - 10. Petroleum Equipment Industry (PEI):
 - 11. Occupational Safety and Health Administration (OSHA):

1.04 DEFINITIONS:

- A. "Piping" includes in addition to pipe, all fittings, valves, sleeves, hangers, and other supports and accessories related to such piping. The definition of 'piping' is limited to the distribution of fluids and does not include structural elements for tanks and their appurtenances.
- B. The words "furnish and install", "provide", "furnish", and "install" are used to mean the Contractor shall furnish and completely install the system, service, equipment, or material named along with other associated devices, equipment, material, wiring, piping, etc. as required. System shall be a complete operating installation, and shall conform to the codes, standards and guidelines applicable to this type of project.
- C. It is the intent of the specifications and drawings to call for finished work, tested and ready for operation.
 - 1. All apparatus, appliances, materials, or work not shown on drawings but mentioned in specifications, or vice versa, and/or all incidental accessories necessary to make work complete and ready for operation, even though not specified or shown on drawings, shall be furnished and installed without increase in contract price.
 - 2. Should there be discrepancies or questions of intent, refer matter to the Owner in writing for a decision before ordering any equipment or materials or before starting any related work.

1.05 SUBMITTALS:

- A. Compliance submittals shall be processed in accordance with 013300 Compliance Submittals.
- B. Submittals are required for all material specified in this Division. If material or equipment is shown on the drawings to be included in this project but is not specified, the Contractor shall bring this to the immediate attention of the Engineer. Submittals are required for all material and equipment incorporated into this project whether specified or not.
- C. The Contractor's attention is called to the Engineer's review of Compliance Submittals. This review shall be completed and the submittal returned to the Contractor before starting procurement, installation or fabrication.
- D. The Contractor's submission of a compliance submittal constitutes that he has both verified and coordinated all dimensional data, quantities, field conditions, catalog data, and compliance with the specification or he assumes full responsibility for doing so.
- E. Compliance Submittals shall include all components and units of fabrication for the fueling system specified in the following sections:
 - 1. Section 335243.11 Fuel System Piping Specialties
 - 2. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
 - 3. Section 335243.15 Fuel System General Valves
 - 4. Section 335243.16 Aviation Fuel Control Valves
 - 5. Section 335243.21 Fuel System Metering Equipment
 - 6. Section 33 5243.23 Fuel System Pumps
 - 7. Section 335243.24 Fuel System Inspection, Testing, and Flushing
 - 8. Section 335243.28 Fuel System Filtration
 - 9. Section 335243.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems
 - 10. Section 335643.15 Fuel System Aboveground Horizontal Tanks
- F. Submittal Formats are as follows:
 - 1. Product Information: Submit manufacturer's data sheets identifying equipment size, descriptions, materials, ratings, etc.
 - 2. Drawings: Submit drawings which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.
 - 3. Instructions: Preprinted material describing installation of a product, system or material, including special notices and material safety data sheet, if any, concerning impedance, hazards and safety precautions.

- 4. Statements: A document required of the Contractor, or through the Contractor, from a supplier, installer, manufacturer, or other lower tier Contractor. The purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications or other verifications of quality.
- 5. Reports: Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.
- 6. Certificates: Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of this contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements that are being certified.
- 7. Records: Documentation to record compliance with technical or administrative requirements.
- 8. Submittal Review Action:
 - a. A Approved: Indicates information is sufficient in detail and adequately organized for performance of the review. Material conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as submitted.
 - b. B Approved as Noted/No Resubmittal Required: Indicates information submitted is sufficient in detail and adequately organized for performance of the review. Material conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as noted. Submitted item is not considered by the reviewer to be a critical element of the project and/or noted comments are minimal in quantity and complexity so that no additional review is necessary. Copies with limited marks are acceptable to all parties as permanent record documents.
 - c. C Approved as Noted/Resubmit: Indicates information submitted is sufficient in detail and adequately organized for performance of the review. Item generally conforms to the intended functional requirements of the contract documents and is approved for fabrication, procurement and incorporation into the project as noted. Submitted item is not considered by the reviewer to be a critical element of the project but noted comments are sufficient in quantity or complexity so that resubmission is appropriate to assure responsive action, or copies with marks are not acceptable to all parties as permanent record documents. Item must be resubmitted responsive to the reviewers' comments.
 - d. D Revise/Resubmit: Indicates information submitted may not be sufficient in detail or adequately organized for performance of the review. Item may appear to conform to the intended functional requirements of the contract documents but certain elements do not or lack sufficient information to be evaluated. Item is not approved for fabrication, procurement or incorporation into the project. Submitted item is considered by the reviewer to be a critical element of the project and/or noted comments are sufficient in quantity or complexity so that resubmission is necessary to assure acceptable responsive action and conformance with the contract documents. Item must be resubmitted responsive to the reviewers' comments.
 - e. E Rejected/Resubmit: Indicates information submitted is not sufficient in detail, is not adequately organized for performance of the review, or does not conform to the intended functional requirements of the contract documents. Item is not approved for fabrication, procurement or incorporation into the project. Item must be resubmitted responsive to the contract documents and reviewers comments.
 - f. F No Action Required: Indicates item has been submitted for informational purposes only and no action response or comments are needed by the reviewer. Item should be retained in project files.
 - g. G Not Subject to Review: Indicates submission of item was not required by the contract documents and is not part of the reviewers contractual project scope. Item is

being returned without review or comment.

1.06 QUALITY ASSURANCE:

- A. Minimum Qualifications for Aviation Fuel Distribution System Contractor: All Aviation Fuel Distribution System work as outlined in this section and any related sections shall be completed by a contractor and/or subcontractor who:
 - 1. Has been involved in the construction of aviation fueling industry projects for a minimum of five (5) years.
 - 2. Has successfully completed three (3) projects similar in complexity and scope within the last five (5) years. The contractor shall provide references on these projects to include contact name, phone number and organization.
 - 3. Has developed and implemented an aviation fuel system flushing plan, using either a recirculation method or by flushing into mobile tankage. The flushing plan must have incorporated the fuel quality requirements of ATA 103. Provide a list of projects where flushing plans have been developed and implemented by the contractor.
 - 4. Has as a member of his team, a controls subcontractor who has successfully completed three (3) PLC based Emergency Fuel Shutoff Systems (EFSO) for airport fueling systems, for projects similar in complexity and scope within the last five (5) years. The controls contractor shall provide references on these projects to include contact name, phone number and organization.
- B. Materials and equipment shall be new, unused, and shall bear manufacturer's name, model number, and other identification marking.
- C. Materials and equipment shall be standard product of manufacturer regularly engaged in the production of required type of material or equipment for at least 5 years (unless specifically exempted by Engineer in writing) and shall be manufacturer's latest design having published properties.
- D. Equipment shall have been in satisfactory commercial service for 2 years prior to bid opening unless specified by model # and manufacturer.
- E. If more than one unit of the same type of equipment is required, (i.e., control valves, manual valves, etc.) they shall be products of a single manufacturer.
- F. All equipment, materials, components, coatings, and accessories provided shall be suitable for use with the specific fuel type being used in the system. The following table is provided to indicate the basic design conditions of the components:

SERVICE	PRESSURE	TEMPERATURE	SPECIFIC GRAVITY
Jet Fuel (ANSI 150 lb)	275 psig	-20 to 110 degrees F	0.81 +/- 0.05
Avgas	275 psig	-20 to 110 degrees F	0.65 +/- 0.05

- G. The Contractor is responsible for protecting all equipment and material from loss or damage until the system is completed and accepted by the Owner.
- H. All portions of equipment coming in contact with Jet A or Avgas shall be free of copper, brass, bronze or zinc material. Aluminum is not allowed unless specified otherwise. All trim shall be stainless steel.
- I. The Contractor shall be responsible for coordinating with the manufacturer for installation of the equipment furnished. The Contractor shall be responsible for warranty work required and shall coordinate with the manufacturer of the equipment to accomplish warranty work including any labor and additional cost for such warranty work. The equipment manufacturer shall provide the Contractor with installation manuals and instructions. The Contractor shall receive and install this equipment for a complete furnished and installed installation including all accessories as specified within these specifications and as shown on drawings.

- J. The Contractor shall check equipment delivered to job site by the equipment supplier against approved Compliance Submittals or other required documentation. The Contractor shall report all discrepancies, shortages, or lack of data to the Owner and equipment supplier for adjustments within one week after equipment is received. If such report is not made within one week, it shall be assumed no discrepancies, shortages, or lack of data has been found.
- K. Contractor shall provide the following for all equipment furnished:
 - 1. All rough-ins for equipment and accessories.
 - 2. Installation of loose trim provided with equipment by the equipment supplier.
 - 3. Furnish and install all piping connections, valves, unions, control valves, drains, and other accessories as indicated on the plans and as specified here within these documents.
- L. The products of specific manufacturers have been used as the basis of design. Any changes to the structure, piping, controls, and electrical connections that result from the use of other manufacturers shall be coordinated with all other trades by the Contractor and approved in writing on letterhead by the Engineer before the ordering of the equipment from the manufacturer. Any resultant modifications required shall be performed without incurring additions to the contract price.
- M. The bid shall be based only on products specified. The Contractor shall verify delivery dates for timeliness before submitting his bid. Desired product substitutions shall be brought to the Engineer's attention prior to bidding. No consideration shall be given to substitutions after bids are received.
- N. Unless this Contractor states in writing at the time of pricing any and all exclusions to these specifications or drawings in his bid proposal, this Contractor shall furnish and install at the job site the equipment, material, labor and services as specified herein and shown on the drawings for the amount of his bid.

1.07 DRAWINGS:

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. All drawings and details shall be examined and coordinated by the Contractor to establish exact location of piping and equipment. Where conflicts occur, the Contractor shall inform the Owner immediately.
- B. The Contractor shall follow all contract drawings in laying out work and shall check shop drawings of other trades to verify spaces in which work will be installed.

1.08 MAINTENANCE MANUALS:

- A. In addition to the requirements specified in the General Conditions, at the project's completion, the Contractor shall submit a complete system Operating and Maintenance Manual (O&M). The manual at a minimum shall include the following:
 - 1. The manual shall be composed of typed instruction sheets with large drawing sheets (not reduced) folded in with reinforced margin. It shall have a post binder system so that the sheets can be easily substituted and shall have a hard cover.
 - 2. The manual shall be organized into systems and shall contain the manufacturer's complete detailed operating and maintenance instructions with data sheets for each piece of equipment furnished under this project.
 - 3. Include a spare parts list for each major piece of equipment furnished for the project including but not limited to:
 - a. Pumps
 - b. Control Valves
 - c. Filters
 - d. Tanks
 - e. Manual Valves
 - f. Meters
 - 4. Provide a comprehensive list of maintenance procedures for preventative maintenance and troubleshooting; repair and reassembly, aligning and adjusting, and disassembly.

1.09 CODE REQUIREMENTS AND PERMITS:

- A. All work indicated on the contract drawings and herein specified shall conform to all applicable codes or laws of the State of Kansas and any other governmental bodies having jurisdiction and shall be installed to the satisfaction of the inspecting authority.
- B. Any deviations from the contract documents or specifications required for conformance with the applicable codes or laws shall be made without change in contract price, but not until such deviations have been brought to the attention of, and approved in writing, by the Engineer.
- C. The applicable codes and laws shall govern the minimum requirements only. Where the drawings or specifications call for materials, construction limitations, or other similar requirements in excess of the code requirements, the drawings and specifications shall be followed.
- D. The Contractor shall obtain and pay for permits and licenses, and shall pay all fees and taxes and give all notices bearing on the conduct of the work as drawn and specified. Certificates of compliance, approval, or acceptance from all authorities having jurisdiction over the work shall be obtained and delivered to the Owner.
- E. All work indicated on the drawings and herein specified shall conform with all applicable standards of the National Fire Protection Association, American Petroleum Institute, Energy Institute, American National Standards Institute and American Society for Testing and Materials.
- F. All work indicated on the drawings, and herein specified, or tasks required in the performance of the work but not specifically indicated in the drawing or specifications, shall conform with the applicable requirements of the Occupational Safety and Health Administration (OSHA) as provided in 29 CFR. Applicable requirements include, but are not limited to, Part 1910 – Occupational Safety and Health Standards and Part 1926 – Safety and Health Regulations for Construction.
- G. All equipment, materials, and specialties shall be installed and connected in accordance with the best engineering practice and standards for this type of work. Unless otherwise specified or shown on the drawings, the recommendations and instructions of the manufacturer shall be followed for installing the work.
- H. The Contractor shall promptly notify the Owner in writing, of any instances in the specifications or on the drawings that are in conflict with any of the aforementioned authorities so that any required changes shall be adjusted before the contract is awarded. If the Contractor performs any work contrary to such laws, rules, regulations or recommendations, without notice, he shall bear all cost arising therefrom.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION:

- A. Contractor shall be responsible for the safety and protection from loss or damage of all equipment and material received until all the work under this contract is complete and the Contractor has received final acceptance. Protect all equipment and material during storage and prior to start-up, which shall include the coverings of all openings, protection against rust and other damage, etc.
- B. For all industrial control panels as defined by Article 100 and Article 409 of the NEC, determine the short circuit current ratings (SCCRs) in accordance with UL 508A. All industrial control panels shall be labeled with their SCCR in accordance with NEC Article 509 and UL 508A. Submit, with all equipment product data, each applicable equipment item's SCCR.
- C. Contractor shall ensure that all equipment installed as part of this contract shall be properly aligned, adjusted and lubricated before final acceptance.
- D. Contractor shall spot paint all equipment where the shop paint has been damaged or flaked off.

- E. Furnish all bolts, studs, nuts and gaskets for makeup of all connections to the equipment and replace all gaskets, bolts and fasteners damaged or as directed during the flushing process.
- F. All connections to equipment shall be made with socket welds, unions or flanges.

3.02 REQUIREMENTS:

- A. Mechanical and electrical designs are based on the requirements for the specified manufacturers listed in the equipment specification. Conduit sizes are selected on the basis of specified equipment. Increased manufacturers requirements necessitating piping changes, additional power conductors, controls, foundations, etc., or any changes required to accommodate any alternate or substitute manufacturer's equipment, other than as shown on drawings shall be provided without any increase in contract price by Contractor.
- B. Manufacturers, where specifically called for, must provide factory tests, unit installation observations, unit start-up and tests, etc., as specified. Signed reports shall be submitted to the Owner upon completion of these services. Subletting of these services will not be permitted. Compliance Submittals shall be accompanied with a letter of certification by the manufacturer that the specified services shall be provided. Failure to do so shall be cause to reject the Compliance Submittals.
- C. The Contract Drawings are in part schematic, intended to convey the scope of work and indicate the general layout, design, and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general construction drawings, electrical drawings, and all other drawings for this project. Contractor shall verify all existing site conditions to determine all conditions affecting the work shown or specified. The Contract Drawings are not to be scaled and the Contractor shall verify areas in which the work is to be installed.
- D. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum space conditions at all points. Where space conditions appear inadequate, Owner shall be notified before proceeding with installation.
- E. All work shall be performed by trained personnel of the particular trade involved and shall be done in neat and workman like manner as approved by the Owner.
 - 1. Work shall be performed in cooperation with other trades and scheduled to allow timely and efficient completion of project.
 - 2. Furnish other trades advance information on locations and sizes of frames, boxes, sleeves and openings needed for work. Also furnish information and shop drawings necessary to permit other trades affected to install their work properly without delay.
 - 3. Where there is evidence that work of one trade will interfere with work of other trades, all trades shall assist in working out space conditions to make satisfactory adjustments.
- F. Work installed before coordinating with other trades causing interference with work of such other trades shall be changed to correct such condition without increase in contract price and as directed by the Owner.
- G. Where specific details and dimensions are not shown on the drawings, the Contractor shall take measurements and make layouts as required for the proper installation of the work and for coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications, it shall be assumed by the signing of the Contract that the higher cost (if any difference in costs) is included in the contract price. The Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Owner.
- H. The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the Owner's operation. Before any work is started, the Contractor shall consult with the Owner and arrange a satisfactory schedule.
 - 1. Make temporary alterations as required to execute work so that all operations and services are maintained with the minimum possible interruption.
 - 2. Temporary shut-downs shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless Owner grants specific written
permission to the contrary.

I. It is the responsibility of the Contractor to monitor the construction area for the presence of flammable vapors and to assure the proper construction methods and equipment is used if hazardous conditions exist.

3.03 EXISTING CONDITIONS:

- A. Each bidder shall inspect the site as required for knowledge of existing conditions. Failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the Contract.
- B. Where new work cannot be installed without changes in existing plant, facility, or systems or where it is indicated on drawings to re-work an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the contract cost will not be allowed because of the Contractor's failure to inspect existing conditions.
- C. Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection. They are not to be construed as "As Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions at the project site and to perform the work as required to meet the existing conditions and the intent of this work indicated.
- D. Unless specified otherwise, all existing material and equipment shown or required to be removed from existing construction and not shown to be reused or turned over to the Owner shall become the property of the Contractor and shall be promptly removed from the site.
- E. Any existing material or equipment which is to be reused or is to remain in place and which is damaged by this Contractor in performing the contract work shall be repaired to the satisfaction of the Owner or shall be replaced with new equipment and material.

3.04 STORING MATERIALS:

A. Unless otherwise arranged for by the Contractor, buildings of the Owner shall not be used for Contractor storage or job office purposes. Open or exposed space for storage of material and location of temporary job facilities will be allocated to the Contractor. The Contractor, at his own expense, shall provide any temporary structures such as trailers and sheds, as may be required for this purpose.

3.05 BASES, FOUNDATIONS, SUPPORTS, AND ATTACHMENTS:

- A. The Contractor shall provide all structural steel, concrete, and materials necessary to properly support and anchor equipment and lines provided under this Contract.
- B. All equipment and materials shall be securely attached in an approved manner. Attachments shall be of a strong and durable nature and suitable for the service required.
- C. Concrete bases shall be provided where shown on the drawings. Equipment which is to be grouted in place shall be grouted with non-shrink grout.
- D. All equipment shall be mounted, aligned, adjusted, and serviced in accordance with manufacturer's recommendations before system testing and final acceptance of the system.

3.06 ELECTRICAL COORDINATION:

A. All electrical products and their installation shall be in accordance with Division 26 of these specifications.

3.07 TESTING LABORATORY SERVICES:

- A. The Contractor shall secure the services of an independent testing laboratory approved by the Engineer and Owner to perform all testing, witnessing and certification of materials. This applies to coating integrity, fuel acceptability, pressure tests and weld examinations.
- B. The cost for all laboratory services will be the responsibility of the Contractor.
- C. The laboratory shall:
 - 1. Cooperate with the Owner and Contractor; and provide qualified personnel promptly on notice.

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- 2. Perform specified inspections, sampling and testing of materials and methods of construction:
 - a. Comply with specified standards; ASTM, other recognized authorities and as specified.
 - b. Ascertain compliance with requirements of Contract Documents.
- 3. Promptly notify the Owner and Contractor of irregularities or deficiencies of work, which are observed during performance of services.
- 4. Promptly submit 2 copies of reports of inspections and test to the Owner including:
 - a. Date Issued
 - b. Project Title and Number
 - c. Testing Laboratory Name and Address
 - d. Name and Signature of Inspector
 - e. Date of Inspection or Sampling
 - f. Record of Temperature and Weather
 - g. Date of Test
 - h. Identification of Product and Specification Section
 - i. Location in Project
 - j. Type of Inspection or Test
 - k. Observations Regarding Compliance with Contract Documents
- 5. Perform additional pre-approved services as required by the Engineer, Owner, and Contractor.
- 6. The laboratory is not authorized to:
 - a. Release, revoke, alter, or enlarge on, requirements of Contract Documents
 - b. Approve or accept any portion of work
 - c. Perform any duties of the Contractor
- D. The Contractor shall:
 - 1. Coordinate laboratory services, cooperate with laboratory personnel, provide access to the project and to manufacturer's operations.
 - 2. Furnish to laboratory preliminary representative samples of materials to be tested, in required quantities.
 - 3. Furnish labor and facilities:
 - a. To provide access to work to be tested
 - b. To obtain and handle samples at the site
 - c. To facilitate inspections and tests
 - d. For laboratory's use for storage of test samples
 - 4. Arrange with laboratory and pay for pre-approved additional samples and tests required for Contractor's convenience.
 - 5. The Owner shall reserve the right to request the Contractor to obtain the services of a separate, equally qualified independent testing laboratory, to perform additional inspections, sampling and testing required when initial test indicate work does not comply with contract documents. The Contractor shall pay the costs of such retesting.

3.08 WARRANTY BY CONTRACTOR:

A. Warrant all systems, equipment, materials and components installed under these specifications for a period of not less than one (1) year from time of beneficial use of the facility and systems by the Owner. Coatings shall be warranted for a period of five (5) years for pitting, rusting, and adhesion.

SECTION 335243.11 FUEL SYSTEM PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Components specified in this section shall be considered fuel system specialties. The Contractor shall be responsible for providing a complete installation of these items, which shall include all labor and materials required.
- B. The work and components specified in this section are directly related to, but not limited to, Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation.
- C. This section of the specification includes piping specialty items that are not considered general piping materials, but are contiguous to the overall piping system.
- D. The Contractor shall provide the necessary labor and materials to install the items specified herein, and as indicated on the Contract Drawings.
- E. All materials shall be of a domestic manufacturing process and shall be certified as such in the Compliance Submittals.
- F. All components shall be suitable for use in aviation fuel systems with the characteristics specified in Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- D. Section 335243.15 Fuel System General Valves
- E. Section 335243.16 Aviation Fuel Control Valves
- F. Section 335243.21 Fuel System Metering Equipment
- G. Section 335243.23 Fuel System Pumps
- H. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- I. Section 335243.28 Fuel System Filtration
- J. Section 335243.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems
- K. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES

- A. American Petroleum Institute (API)
- B. American Society of Mechanical Engineers
- C. Underwriters Laboratory (UL)
- D. Oil Companies Materials Association (OCMA)
- E. American Society of Mechanical Engineers (ASME)
- F. Factory Mutual (FM)

1.04 SUBMITTALS

- A. Submit as specified in Section 01 33 00 Compliance Submittals.
- B. Product Data:
 - 1. 15 gallon Sump Separator
 - 2. Surge Absorber
 - 3. Automatic Air Vent
 - 4. Strainer
 - 5. Fuel Sampling Connections
 - 6. Jet-A Loading Hose Swivel joint
- 335243.11 Fuel System Piping

Specialties

- 7. Avgas Loading Hose Swivel joint
- 8. Loading Hose
- 9. Avgas Refueler Loading Hose nozzle
- 10. Jet-A Loading Hose Nozzle
- 11. Over the road transport Unloading Adapter
- 12. Vapor Recovery Connection
- 13. Flex Connector
- 14. Jet-A Refueler Unloading Single Point Receptacle
- 15. Instrument Tubing and Fittings
- 16. Pressure Gauges and Accessories
- 17. Fire Extinguisher
- 18. Deadman Control System
- 19. Meter Prover Connection
- 20. Low Point Drain Connection
- 21. High Point Vent Connection
- 22. Thermowell
- 23. Floating Suction
- C. Shop Drawings
 - 1. Sump Separators
- D. Quality Assurance
 - 1. Test Reports
 - 2. Certifications
 - a. Hose certifications
- E. Closeout Submittals
 - 1. Warranty.

1.05 QUALITY ASSURANCE

- A. All piping specialties shall be in compliance with the applicable codes and standards such as ASTM, ANSI, API, etc. as specified in Section 335243.00 Fuel System General Provisions.
- B. The Contractor shall prepare and provide compliance submittals for all piping specialties including the manufacturer, type, materials, and certifications required.
- C. For the purpose of standardization and conformance, components will be specified using a manufacturer name and model number. It should be noted, the term "or approved equal", will be added so as not to limit to the manufacturer listed.
- D. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- E. The manufacturers specified within this section shall have products in satisfactory use in similar applications for a minimum of five years.

PART 2 - MATERIALS

2.01 15 GALLON SUMP SEPARATOR

- A. Provide a 15-gallon, stainless steel sump separator or approved equal. Unit shall be selfcontained designed to separate water and dirt from fuel and shall be mounted on four legs with anchor plates. Vessel shall be cylindrical with a cone bottom. Mount unit so top is a maximum of 4-feet above ground to allow pouring of fuel samples into the separator and high enough to enable draining of water from the separator with a 5 gallon bucket under the drain valve piping. These units shall be mounted on each of the four bulk skids.
- B. Sump Separator shall have a lockable lid.
- C. Separator shall be piped to allow water to be drained by gravity by a ³/₄-inch ball valve with cam-lock and dust cap into bucket. Pump suction shall be means in which to draw off clean

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product and return it to the storage tank during unloading operations or recirculation. Provide the suction connection on the side of the vessel as indicated with an internal drop tube to within 1" of the bottom of the vessel to remove fuel from the vessel. The clean suction line shall be ³/₄" and shall have a flanged insert check valve and spring return closed ball valve. All valves shall be as specified in Section 335243.15 - Fuel System General Valves.

2.02 SURGE ABSORBER

- A. To absorb hydraulic surges within the piping systems, surge suppressors shall be installed. They shall be Parker Model SK05W3FA01A1 or approved equal.
- B. The units shall be contained bladder style with a net gas capacity of 5 gallons. They shall be charged with nitrogen designed to absorb line shock and limit pressure surges to 225 psig due to instantaneous valve closures within the fueling system. System operating pressure is 50 psi.
- C. Construction shall be as follows:
 - 1. Carbon steel chamber to be rated at 275-psig working pressure in accordance with the ASME pressure vessel code with a 3-inch, (150)-pound ANSI raised face flanged connection.
 - 2. Removable stainless steel top shall include charging valve and pressure gauge.
 - 3. Bladder to be Buna-N conforming to MIL-R-6855. Furnish a total of two (2) spare bladders.
 - 4. The piping connection shall be provided with an energy dissipation device designed to provide unrestricted flow into the vessel and restricted flow from the vessel.
 - 5. Surge tank shall be designed for unrestricted inflow and restricted outflow.

2.03 AUTOMATIC AIR VENT

A. The automatic air vent shall have a 3/4-inch air vent with a Stainless Steel Body. Valve, seat, float, and internals shall be stainless steel. Inlet and outlet shall have 3/4" NPT threaded connections. Air vent shall be Armstrong Model 11-AV or approved equal.

2.04 STRAINER

- A. The following strainers shall comply with this paragraph:
 - 1. Jet-A Unload Skid strainer
 - 2. Jet-A Load Skid strainers
 - 3. AVGAS Unload Skid strainer
 - 4. AVGAS Load Skid strainer
- B. The housing and flanges shall be carbon steel with a 304 stainless basket. Seals shall be Teflon and base seal shall be Buna-N. Maximum working pressure shall be 275 psi at 110 degrees F. Strainer shall be 40 mesh. Strainer shall be FMC Technologies Smith Meter 2" – 8" In-Line Series Strainer or approved equal.
- C. Body shall have a bolted cover for easy removal of the basket.
- D. Body shall be include a 3/4" NPT drain connection with ball valve and cam and groove connection with dust cap.
- E. Piping connections shall be in-line ANSI CL150 raised-face flanged.
- F. Provide a differential pressure gauge kit option with isolation valves to monitor basket cleanliness.

2.05 FUEL SAMPLING CONNECTIONS

- A. Fuel sample connections shall be provided as indicated. Contractor shall provide additional temporary fuel sampling connections as required for flushing operations.
- B. The kit shall include stainless steel probe, ball valve and dry break quick coupler with chain affixed dust plug of aluminum suitable for sampling aviation jet fuel or aviation gasoline from piping systems or equipment. Sampling connection shall be installed on side of pipe, (not top or bottom) or as noted on sample station and shall extend to the centerline of the fuel pipe.

2.06 JET-A LOADING HOSE SWIVEL JOINT

- A. To provide operational flexibility, the loading hose units shall be equipped with style #30 swivel joint. Swivel Joint shall be Emco Wheaton D2000 Swivel Joint or approved equal.
- B. The swivel joint shall have a 3-inch ductile iron flanged body with female threaded sleeve with a minimum operating range of 150 psi working pressure to full vacuum. Swivel joint shall be provided with 3-inch 150# ANSI inlet and outlet flanged connections. Provide threaded flange connection to transition to loading hose. The swivel joint shall be non-lubricated type.

2.07 AVGAS LOADING HOSE SWIVEL JOINT

- A. To provide operational flexibility, the loading hose units shall be equipped with style #30 swivel joint. Swivel Joint shall be Emco Wheaton D2000 Swivel Joint or approved equal.
- B. The swivel joint shall have a 3-inch ductile iron flanged body with female threaded sleeve with a minimum operating range of 150 psi working pressure to full vacuum. Swivel joint shall be provided with 3-inch 150# ANSI inlet and outlet flanged connections. The swivel joint shall be non-lubricated type.

2.08 LOADING HOSE

- A. For the loading of Jet-A fuel the equipment shall include a 3-inch hose. Hose shall be capable of 150 psi working pressure.
- B. For the loading of Avgas fuel the equipment shall include a 2-inch hose for Avgas. Hose shall be capable of 150 psi working pressure
- C. The hose shall be 10 ft in length
- D. Tube shall be nitrile with single ply, high-tensile nylon cord reinforcement interwoven hard wall construction with a black neoprene cover and meet the requirements of API 1529 Grade 2 Type C and NFPA 407.
- E. Provide separate commercial hose through as detailed for each loading hose.
- F. Provide hose certification.

2.09 AVGAS REFUELER LOADING HOSE NOZZLE

A. To interface with avgas aircraft refueling vehicles, provide a 2-inch OPW Kamvalock nozzle.

2.10 JET-A LOADING HOSE NOZZLE

- A. To interface with aircraft refueling vehicles, provide a single point commercial refueling nozzle. The refueling nozzle shall be a Cla-Val Model 347GF or approved equal.
- B. The 2-1/2-inch-diameter aluminum and stainless coupler with CRES wire races shall include a 60 mesh strainer and swivel with a 3-inch female NPT inlet. The coupler shall be compatible with a standard 3-lug adapter. The nozzle shall be provided with a 35 psi pressure regulator. The nozzle shall include a male quick disconnect adapter.

2.11 OVER THE ROAD TRANSPORT UNLOADING ADAPTER

- A. Provide a 3 inch cam and groove adapter for connection of the Avgas delivery vehicles hoses. Provide dust cap. Coupler shall be OPW 633 series and dust cap OPW 634-B or approved equal.
- B. Provide a [4 inch] cam and groove adapter for connection of the Jet-A and delivery vehicles hoses. Provide dust cap. Coupler shall be OPW 633 series and dust cap OPW 634-B or approved equal.

2.12 VAPOR RECOVERY CONNECTION

A. The 3 inch vapor recovery connection shall be a standard poppet style adapter. Body shall be anodized aluminum construction. Stem shall be chrome plated steel. Spring shall be stainless steel and gasket shall be nitrile. The Connection shall be OPW 1611AV with a OPW 1711T cap or approved equal.

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2.13 JET-A REFUELER UNLOADING SINGLE POINT RECEPTACLE

A. Provide a 2 ½" aircraft standard bayonet refueling single point adapter to allow the connection of the refueler trucks to offload fuel and return fuel to the storage tanks. The adapter shall be a have a 3" ANSI 150 flat face flange connection. Provide no product selection, provide plastic dust cap, and provide pressure relief valve.

2.14 INSTRUMENT TUBING AND FITTINGS

- A. Tubing:
 - 1. Material shall be ASTM A269 Type 304 annealed stainless steel.
 - 2. Wall thickness shall be as required by the fittings, but not less than .049".
- B. Fittings:
 - 1. Manufacturer shall be Parker-Hannifin "Ferulok" or Swagelok stainless steel bit-type tube fittings for flareless tubes.
- C. Instrument Valves:
 - 1. Instrument valves shall be instrument grade block and bleed needle valve as manufactured by Wika Type 910.11.200 or approved equal.
 - 2. Body shall be A316 stainless steel, with working pressure of 6,000 psi.
 - 3. Packing shall be fire resistant and as recommended by the manufacturer for use with hydrocarbon fuels.

2.15 PRESSURE GAUGES AND ACCESSORIES

- A. Pressure gauges shall be WIKA Model 233.53 or approved equal. Pressure gauges shall be graduated in pounds per square inch (PSI). Under normal operating conditions, all gauge pointers shall be approximately vertical and be located at mid-point of scale. Each gauge shall be equipped with a steel ½-inch instrument valve with bleed port. The gauge shall be silicone filled and have all internal parts immersed. Install gauges using pipe-fittings as shown on the drawings. Furnish all pressure gauges with bleeder to remove air from the bourdon tube. Pressure ranges shall be as indicated on the plans.
- B. Unless otherwise specified or indicated on the drawings, all indicating pressure gauges shall be 4-inch dial size, shatter proof lens, with stainless steel case, having a +/- 1.0 percent accuracy over its full range. It shall also have a 316 stainless steel bourdon tube, bellows, diaphragm and a ½-inch rear NPT connection. Gauges shall be mounted as indicated on plans or in a panel as indicated with the differential pressure gauge and labeled as indicated on the flow diagram.

2.16 FIRE EXTINGUISHER

A. Provide a 80# B:C fire extinguisher at each loading/unloading/dispensing location. Provide attachment bracket on skid column or separate support and provide signage with 2" high red letters stating "FIRE EXTINGUISHER".

2.17 DEADMAN CONTROL SYSTEM

- A. Provide an electric deadman system with machined aluminum control handle. Provide with a 20 ft. coiled cord. Entire system shall be intrinsically safe with 120V AC relay located in an explosion proof enclosure. Deadman controls shall be Crown Products Rhino Deadman System or approved equal.
- B. Deadman activation shall close the loading control valve through the 120V solenoid on the control valve. The pump shall continue to operate.

2.18 METER PROVER CONNECTION

- A. To facilitate meter proving operations, the piping system shall have dedicated meter prover connections. The hose connections shall be OPW fittings #633-A and 634-B or approved equal.
- B. The assembly shall include a 3-inch adapter and protective cap of aluminum.

2.19 LOW POINT DRAIN CONNECTION

A. The piping system shall have dedicated low point drains. To facilitate pumping out of these points, a quick connect coupling shall be used.

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Specialties

B. The quick connect coupling assembly shall be a 2-inch, or per contract drawings, OPW Type #633-A adaptor with female NPT 634-B dust cap or approved equal.

2.20 HIGH POINT VENT CONNECTION

- A. High point vents shall have a quick connect coupling to facilitate the venting of the fuel pipe.
- B. The quick connect coupling shall be a 1-inch OPW Type #633-A female NPT Kamlok with dust cap or approved equal.

2.21 FLOATING SUCTION

- A. It shall be the responsibility of the manufacturer to design, fabricate and install the swing line pipe and float assembly to ensure satisfactory operation in Jet-A (full range of Jet-A specific gravity) and Avgas (full range of Jet-A specific gravity).
- B. Provide swing line pipe fabricated of 10-gauge aluminium, stainless steel or carbon steel conforming to ASTM A283C. Provide dielectric connection (e.g. insulating flange) for connection of dissimilar metals.
- C. Provide at swing pipe inlet a short-radius, seamless pipe suction elbow, light weight or Schedule 10, aluminum, stainless steel or carbon steel conforming to ASTM A234, with bell mouth and antivortex baffles or other turbulence-minimizing devices. Provide 1/8" vent hole on top of elbow for venting of air upon initial tank fill. Floats and vent hole location shall be designed so that the vent hole is always submerged during normal operation.
- D. Provide floats as necessary to ensure floatation of swing line in fuel product. Floats to be fabricated of 10-gauge aluminium, stainless steel, or carbon steel conformint to ASTM A283C.
- E. Pneumatically test floats for leaks.
- F. Provide swing line pipe of suitable length to limit the floating suction arm assembly vertical travel to 60 degrees relative to a horizontal line extended from the centerline of the tank connection.
- G. Floating Suction shall be maunfactured by OPW, GNY, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All components shall be installed in the piping system as indicated on the Contract Drawings. Where exact dimensions are not indicated, the drawings may be scaled to determine an approximate location.
- B. The Contractor shall be responsible for providing the necessary labor and materials to install the component.
- C. The Contractor shall be responsible for providing the proper clearances of all components to assure adequate operational and maintenance clearances.
- D. Install all components in accordance with manufacturer's instructions. Properly torque bolts, etc. as required.

3.02 INSPECTION AND TESTING

- A. The work will be inspected for approved manufacturer, component type and final installation.
- B. The Contractor shall be responsible for the adjustments of all devices to assure proper function of the device is provided.

SECTION 335243.13 AVIATION FUEL PIPE, FITTINGS, AND INSTALLATION

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section of the specifications describes and provides for the furnishing, installing and testing of pipe and piping components for the aviation fueling system.

1.02 RELATED SECTIONS:

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.15 Fuel System General Valves
- E. Section 335243.16 Aviation Fuel Control Valves
- F. Section 335243.21 Fuel System Metering Equipment
- G. Section 335243.23 Fuel System Pumps
- H. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- I. Section 335243.28 Fuel System Filtration
- J. Section 335243.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems
- K. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. A53 Pipe, Steel, Black, and Hot Dipped, Zinc Coated Welded and Seamless.
 - 2. A105 Forging, Carbon Steel, for Piping Components.
 - 3. A182/A182M Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
 - 4. A193 Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - 5. A194 Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service.
 - 6. A234 Piping Fitting of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
 - 7. A312/A312M Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - 8. D910 Standard Specification for Aviation Gasolines
 - 9. D975 Standard Specification for Diesel Fuel Oils
 - 10. D1655 Standard Specification for Aviation Turbine Fuels
 - 11. D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel
- B. American Society of Mechanical Engineers (ASME)
 - 1. B1.20.1 Pipe Threads, General Purpose (inch)
 - 2. B16.5 Pipe Flanges and Flanged Fittings.
 - 3. B16.9 Factory Made Wrought Steel Butt Welding Fittings.
 - 4. B16.11 Forged Steel Fittings, Socket Welding and Threaded.
 - 5. B16.20 Metallic Gaskets for Pipe Flanges Ring Joint, Spiral Wound, and Jacketed.
 - 6. B16.25 Buttwelding Ends.
 - 7. B31.3 Process Piping.
 - 8. BPVC Section IX Welding, Brazing, and Fusing Qualifications
- C. American Petroleum Institute (API):
 - 1. Spec 5L Line Pipe.
 - 2. API RP 1110 Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or

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Carbon Dioxide.

- 3. Std. 601.21 Metallic Gaskets for Piping, Double-Jacketed Corrugated and Spiral Wound.
- 4. Std. 2015, Safe Entry and Cleaning of Petroleum Storage Tanks.
- D. American Welding Society
- E. Federal Specifications (FS) QQ-P-416 Plating, Cadmium.
- F. National Electrical Manufacturer's Association (NEMA)
- G. ASTM D 3359-95 Standard Test Methods for Measuring Adhesion by Tape

1.04 DEFINITIONS:

- A. Unless otherwise specified, the working pressure ratings as used in these specifications for valves, fittings, unions, and other piping specialties refer to pressure ratings in pounds per square inch above atmosphere (PSIG) in accordance with applicable ASME Standards.
- B. The use of the word "piping" shall be interpreted to include all pipe, valves, fittings, flanges, supports, or accessories for any particular portion of the work, or system to which the word "piping" is applied.

1.05 SUBMITTALS:

- A. Submit as specified in Section 013300 Compliance Submittals.
- B. Product Data: Submit manufacturer's data sheets identifying equipment size, materials, pressure ratings, etc.
 - 1. Carrier Pipe (Avoveground)
 - 2. Flanges
 - 3. Fittings
 - 4. Bolts
 - 5. Nuts
 - 6. Gaskets
 - 7. Branch Connections
 - 8. Anchor Bolts
 - 9. Pipe Supports
- C. Shop Drawings
 - 1. Long Radius Pipe Bends
 - 2. Pipe Supports
- D. Instructions
 - 1. Pipe Supports
 - 2. Anchor Bolts
 - 3. Gaskets
- E. Quality Assurance
 - 1. Design Data
 - a. Calculations
 - 2. Test Reports
 - a. Radiographic
 - 3. Qualification Statements
 - a. Welder Performance Qualifications (WPQ)
 - b. Welding Procedure Specifications (WPS)
 - c. Procedure Qualification Records (PQR)
 - d. Welder Performance Qualification Test Certificates
 - 4. Certifications
 - a. Carrier Pipe
 - b. Flanges
 - c. Fittings
 - d. Bolts
 - e. Nuts

- f. Piping System Installation
- g. Containment Piping System

1.06 QUALITY ASSURANCE:

- A. All pipe and piping materials shall be provided by a manufacturer and fabricator approved by the Engineer.
- B. Welding operations, qualification of welders and welding procedures shall comply with ASME B31.3 and the ASME Boiler and Pressure Vessel Code, Section IX. Certified copies of the welding procedure, the procedure qualification, and the welder qualification certification must be submitted prior to beginning any welding operations.
- C. Welders must be qualified to position 6G of ASME BPVC Section IX, tested on the type of pipe used in this project, and must have been qualified within the six months preceding this project or the welder shall be re-qualified.
- D. Contractor is responsible for all costs associated with procedure and welder qualifications.
- E. Certified copies of the quality control procedures and results of the internal and external pipe coating application shall be submitted.
- F. No foreign materials or components, supplied as part of this Section, shall be utilized. The use of the words "domestic materials" or "no foreign materials" shall mean all materials shall be of U.S. origin. The Contractor shall certify this condition in the compliance submittals. If at any time, the Owner or Engineer determines that any flanges, fittings, bolts or nuts are not of U.S. origin, the Owner shall be entitled to replace the components without need for individual testing for conformance to technical specifications. Contractor shall be responsible for all costs, including labor, materials and consequential costs, associated with such replacement.
- G. Pipe flanges and fittings shall bear a stamp indicating country of origin.
- H. The installation shall include all necessary materials, coating, supports, controls, valves and fittings, hereinafter described or called for on the Contract Drawings accompanying these specifications, or as necessary to make the installation complete.
- I. The drawings and specifications shall be considered complementary, one to the other, so that materials and labor indicated, or called for, or implied by the one and not the other, shall be supplied and installed as though specifically called for by both.
- J. All materials and equipment provided under these specifications shall be new, unused products of manufacturers regularly engaged in production of such equipment for a minimum of 5 years. All products shall conform to the applicable code or standard for its manufacturing, fabricating and installation.
- K. All testing shall be in accordance with ASME B31.3 for abovegrade and belowground piping. The third party testing agency shall be qualified to perform testing and meet the requirements of ASME.

PART 2 - MATERIALS

2.01 PIPING MATERIALS:

- A. The piping system includes above ground piping only. All above ground piping shall be of single wall construction.
- B. Threaded joints are only allowed for small bore piping that has no internal pressure such as vent or atmospheric drain piping. Threaded joints shall be American Standard for Pipe Threads, ASME B1.20.1. All burrs shall be removed. Pipe ends shall be reamed out to size of bore and all chips shall be removed. Pipe joint compound suitable for use on fuel piping shall be used to seal threaded pipe. Joint compound shall only be applied to male threads.
- C. Furnish and install flanges where shown and at connections to all equipment. Flanged connections are only allowed above ground or within pits/vaults. Flanges shall not be direct buried.
- D. Unless otherwise specified herein or stipulated on the Contract Drawings, all flanges shall be matched on piping, valve or equipment as to size, and shall be constructed from materials

equivalent to the piping. Flanges shall be raised face.

- E. Pipe fittings shall be of standard manufacture of materials, weight, and quality corresponding to the pipe with which they are used.
- F. Fittings such as elbows, tees, reducers and caps shall be used for all changes in piping direction, intersections, size changes and end closures unless otherwise stipulated on the Drawings or specified herein.
- G. The manufacturer or supplier of the piping materials shall provide a certificate of the inspection, stating origin of manufacture and that all material has been manufactured, sampled, tested and inspected in accordance with the specified ASTM, API and other identified specifications and has been found to meet those requirements.
- H. All pipe shall be stamped with specification, grade, and heat number. Shop coated pipe shall have specification, grade, and heat number stenciled on the coating.
- I. All portions of equipment coming in contact with Jet A or AvGas shall be free of copper, brass, bronze or zinc material. Aluminum is not allowed unless specified otherwise. All trim shall be stainless steel. Galvanized piping is not allowed in the aircraft system.

2.02 PIPING SPECIFICATIONS:

A. The following table is provided to indicate the basic design conditions of the components within this section of the specification:

SERVICE	SYMBOL	PRESSURE	TEMPERATURE	SPECIFIC
				GRAVITY
Jet Fuel (ASME	JF	275 psig	-20 to 110°F	0.81+/-0.05
CLASS 150)				
AvGas	AG	275 psig	-20 to 110°F	0.65+/-0.05
Drain	D	275 psig	-20 to 110°F	0.81+/-0.05
Vent	V	275 psig	-20 to 110°F	0.81+/-0.05

- B. The following is provided to indicate the various materials of construction for the design service required by this specification
 - 1. Carrier Pipe Aboveground
 - a. Pipe shall be stainless steel. Material shall be: ASTM A312/A312M, Type 304L, Schedule 40S. Seamless, low frequency welding process less than 1 kHz shall not be used. Fittings shall be stainless steel as well. Coating of piping is not required with stainless steel piping.
 - b. Where applicable, use double random lengths to minimize the number of welds required.
 - 2. Joints
 - a. Pipe Size 2" and Smaller: Socket Weld unless otherwise indicated in details.
 - b. Pipe Size 2-1/2" and Larger: Butt Weld, End preparation to ASME B16.9.
 - 3. Flanges
 - a. Pipe Size 2" and Smaller: ASME Class 150 ASME B16.5, Stainless Steel ASTM A182, Socket Weld Raised-Face.
 - b. Pipe Size 2-1/2" and Larger: ASME Class 150 ASME B16.5, Stainless Steel ASTM A182, Weld Neck Raised-Face.
 - c. Flange face and ASME Class 150 rating to be compatible with corresponding component. Flanges shall be standard 1/16th inch raised face.
 - d. Use flat face flange to mate to the Gorman Rupp Rotoprime pump discharges.
 - 4. Fittings
 - a. Pipe Size 2" and Smaller: Socket Weld, Stainless Steel ASTM A182 Class 3,000.
 - b. Pipe Size 2-1/2" and Larger: Buttweld, ASME B16.9, Stainless Steel ASTM A182, wall thickness to match pipe.
 - c. Notes: Bushings shall not be used except as noted.

- 5. Bolts
 - a. Pipe Size 2" and Smaller: Alloy steel, teflon coated machine bolts, ASTM A193, Grade B7.
 - b. Pipe Size 2-1/2" and Larger: Alloy steel, teflon coated machine bolts, ASTM A193, Grade B7.
 - c. Notes: Studs may be used for corresponding equipment. Cadmium plated bolts may be substituted in lieu of teflon where approved by Owner or Engineer.
- 6. Nuts
 - a. 2" and Smaller: Nuts to be heavy hexagon carbon steel ASTM A194, Grade 2H, teflon coated.
 - b. 2-1/2" and Larger: Nuts to be heavy hexagon ASTM A194 Grade 2H teflon coated.
 - c. If cadmium plated bolts are used, cadmium plated nuts shall be used. If teflon coated bolts are used, teflon coated nuts shall be used. Teflon is the preferred coating, cadmium plating shall be approved by Owner or Engineer.
- 7. Gaskets
 - a. 2" and Smaller: Flexitallic Type CGI 304 Stainless Steel Windings with Thermiculite 835 or graphite filler Conform to ASME B16.20.
 - b. 2-1/2" and Larger: Flexitallic Type CGI 304 Stainless Steel Windings with Thermiculite 835 or graphite filler Conform to ASME B16.20.
 - c. Inner ring shall be 304 stainless steel and outer ring shall be carbon steel.
 - d. Gasket shall meet API 6FB Fire Rating.
 - e. Gaskets shall be color coded on outside circumference to facilitate inspection of installed product.
 - f. Gaskets on Gorman Rupp Rotoprime discharges shall be full face, fire rated.
- C. The interior and exterior coating for all carbon steel pipe and piping materials shall be as specified in Section 099713.00 Fuel System Coatings.
- D. Welded elbows shall be long radius unless otherwise shown.
- E. Changes in direction of pipe of other than 45 degrees or 90 degrees shall be made as follows:
 - 1. With long radius welds cut to proper angle and shop beveled.
 - 2. Or, at the option of the Contractor, with long radius pipe bends. Pipe roundness shall be maintained to factory tolerance for straight pipe lengths. Submit shop drawings of all bends and bending procedures for approval.
 - 3. Bends of 3 degrees or less shall be miter joints.
- F. Tee Connections:
 - 1. Branch connections for aboveground or within vaults, shall be weldolets, sockolets, socket-welded nipolets, or socket-welded elbolets, as manufactured by Bonney Forge or equal.
 - 2. Use for all vent and instrument connections.
- G. Fittings for Threaded Fuel Pipe:
 - 1. Class 3,000 forged steel conforming to ASME B16.11.
 - 2. Threads of threaded jointed piping shall be full, clean, sharp, and true.
 - 3. Bushings shall not be used except as noted on the drawings.

PART 3 - EXECUTION

3.01 CLEAN PIPING REQUIREMENTS:

A. The importance of keeping the interior of all piping systems clean during construction is critical. The Contractor is required to keep the interior of the carrier piping clean from all visible dirt or foreign matter at all times and under all conditions. If for any reason the inside of the piping contains dirt or foreign matter, the Contractor shall correct this condition to the Owner's satisfaction with all necessary material, labor and equipment for cleaning being furnished at the Contractor's expense. The following measures shall be taken to assure cleanliness of the system:

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- 1. The pipe and fittings shall be delivered to the job site sealed. The seals are not to be removed until the pipe is installed. After each day's work, the open ends of all pipe being installed shall be sealed closed with an expansion type weatherproof and watertight seal manufactured for this purpose. At the Contractors option, weld caps or plate steel may be welded into place on the end of the pipe.
- 2. All fittings and valves shall be kept in a covered dry storage area until installation.
- 3. Pipe shall not be installed or stored in areas or ditches containing water or mud.
- 4. At openings for branches in piping, all material that falls into the pipe must be removed before welding in the branch fittings.
- B. Contractor shall install weld caps or plate steel on the end of the pipe between phases of work.
- C. Should the Contractor fail to keep the pipe sealed in the trench and it floods with water and mud, he shall flush the pipe clean with water and dry the piping by blowing -20 deg dried air through the pipe. Air drying shall continue until the dew point of the air exiting the pipe is equal to the dew point of the air entering the pipe. Upon completion of drying operations, the pipe shall have a camera operated down the entire length of the pipe with the results recorded and forwarded to the Owner for review. The flushing/drying will continue until the pipe cleanliness is accepted by the Owner. Water shall not be used if the piping is connected in any fashion (including closed double block and bleed plug valves) to active jet fuel piping.

3.02 HANDLING PIPE:

- A. The shipment, delivery, and installation of all pipe and accessories shall be handled in such manner as to ensure a sound undamaged condition. Particular care shall be taken not to damage pipe coating when storing pipe. No other pipe or materials of any kind shall be placed inside a pipe or fitting after the coating has been applied.
- B. Perform the hauling of pipe and other materials in such a manner as to prevent damage to pipe and material. If damage is sustained, Contractor shall be responsible for repair or replacement cost.
- C. In order to protect the exterior coating from damage, all piping shall be unloaded with padded forks or slings and shall be stored on padded cribbing or supports. All pipe fabrication shall take place on padded supports or cribbing.
- D. Transporting and installation of pipe and other equipment shall be performed such that stainless steel surfaces do not contact carbon steel surfaces. Welding and grinding of carbon steel shall take place adequate distance from all stainless steel such that sparks or particulate will not contaminate stainless steel surfaces. Should the Contractor handle stainless steel pipe or equipment in a manner that causes surface contamination, Contractor shall be responsible for repair or replacement at no cost to Owner.

3.03 FABRICATION AND INSTALLATION:

- A. All piping materials, fabrication, installation and application shall be in compliance with the latest requirements of the code for Process Piping ASME B31.3, and all state and local regulations when applicable.
- B. All temporary piping required for construction, testing, flushing and start-up shall be furnished by the Contractor. Such piping shall remain the property of the Contractor; and it shall be his responsibility to dismantle and remove it from the premises when no longer required.
- C. End Preparation: The base metals for all butt-welding pipe joints shall be prepared to provide for proper "fit-up" in accordance with ASME B16.25. Ends shall be prepared by machining or flame cutting. Hand flame cutting is only allowed subject to approval by the Engineer and only where the use of machine or automatic machine flame cutting is impractical. Hand flame cuttings shall be ground smooth. No welded joint shall be made where either flame cut or machine cut ends provide a spacing between the pipe so large that more than one stringer bead is required to completely close the pipe. Where flame cutting by hand is employed, the included angle or bevel at the end of the pipe shall be not less than plus or minus 5 degrees from that which is required elsewhere in these specifications for machine cut beveled ends. Pipe end for socket welding shall be reamed for the full inside diameter to remove all burrs and obstructions.

- D. All pipe shall follow the routes shown on the drawings and shall be placed accurately to measurements indicated or established from the work. Pipe shall be placed clear of equipment, and other work. Changes in direction shall be made by use of fittings for standard angles and by trimmed fittings for angles other than standard. Reference earlier paragraphs in this section.
- E. Any damage to the internal or external pipe coatings by bending or handling, including lineup of pipe joints, shall be the responsibility of the Contractor and shall be repaired to equal the original coating per Section 099713.00 Fuel System Coatings. Repair of the internal coating damaged by field welding of pipe joints is not required.
- F. Proper pipe joint alignment and separation shall be accomplished without the use of backing rings.
- G. Weld spatter shall be removed around welds leaving a smooth clean surface.
- H. Pipe shall be fabricated to measurements established on the job and shall be carefully worked into place without springing or forcing.
- I. Flanges and unions shall not be placed in a location that will be inaccessible after completion of the work.
- J. All piping and equipment shall be properly supported and guided. Anchors shall be provided where shown and where required to absorb or transmit thrust and eliminate vibration or pulsation.
- K. Changes in pipe size shall be made with reducing fittings. The Contractor shall pay special attention to the type of reducer, and its orientation, shown on the Contract Drawings. Bushings shall not be used unless otherwise shown.
- L. Flanged joints shall be accurately centered and aligned prior to installation of bolts so as to prevent mechanical pre-stressing of the flanges, pipe and equipment.
- M. Verify all measurements before commencing work. Submit discrepancies for clarification before proceeding.
- N. Arrange all piping with proper slopes, without sags, traps, or pockets.
- O. Provide high point vents, pump outs, and low point drains as required and indicated on the drawings.
- P. Do not remove stenciling on stainless steel piping.

3.04 WELDING:

- A. Qualifications of welders shall be done by Contractor in accordance with ASME B31.3, Process Piping and the qualification submitted to the Engineer before welder is allowed to make construction welds. Certified test results for each welder employed by the Contractor shall be kept in the contractor's field office for inspection by the Engineer. Performance test records of welders issued by a previous employer, in lieu of qualification tests conducted by the Contractor, will not be acceptable. The welder must have been qualified within the previous six months of the NTP on the project. The Contractor shall assume the costs for all tests.
- B. Welding and fabrication shall be accomplished in accordance with ASME B31.3 latest edition. Before welding, the piping or other equipment shall be carefully lined up so that no part is offset; flanges and branches shall be set square and true. This alignment must be preserved during the welding operation. If tack welds are used, they must be of the same quality and made by the same procedure as the completed weld. No weld metal shall project within the pipe so as to restrict its area or cause danger of its loosening and falling into the pipe. The piping shall not be split, bent, flattened or otherwise injured before, during or after installation. During erection, care shall be taken to remove all dirt, scale and other foreign matter from inside the piping before tying in sections, valves, equipment or fittings.
- C. Backing rings shall not be used.
- D. All welded joints shall be made as recommended by the standards of the American Welding Society and B31.3. The welding shall ensure complete penetration of the deposited metal with the base metal. The filler shall be suitable for use with the base metal. Mitered joints shall not

be used except where specifically allowed in this specification or on the Contract Drawings.

- E. All manual welds shall be made using downhill welding procedure. Shop welds utilizing machine-welding procedures do not have to qualify to the downhill requirement. Machine-welding procedures must be qualified and submitted to the Engineer.
- F. Qualifications and Approval:
 - 1. Welding procedures that are intended to be used on the job shall be submitted for approval. The Contractor shall be responsible to assure that all welding procedures, welders, and welding operators have been qualified in accordance with applicable code requirements before work is started. Shop and field procedures shall be submitted to the Engineer for approval. The procedure specifications shall be as follows:
 - a. Include copies of the qualification test records as evidence that the procedures have been qualified in accordance with the latest revisions of the following code:
 1) ASME B31.3 Process Pining
 - 1) ASME B31.3 Process Piping.
 - b. Developed for the conditions of this Contract and be complete and specific, and if necessary, differentiate between shop and field welding.
 - c. Welder Performance Qualification Test Certificates:
 - 1) Furnish welder performance qualification test certificates prior to starting work for position 6G for the pipe being installed as part of this project made in strict compliance with the above code.
 - 2) Submit qualification test records for each welder on the project and keep record files.
 - 2. Costs: Costs incident to procedure and welders qualification tests shall be the responsibility of the Contractor.
- G. Each welder shall identify each of his welds with a specific code or identifier. The Contractor shall keep an as built fabrication drawing on the site that identifies the location of each weld made and also indicates the welder who made the weld. The marking shall be made with a "low stress" steel stamp or permanent ink marking. Submit the weld map as part of the project Closeout Documents.
- H. The Owner reserves the right to place welding inspectors (at the Owner's cost) in the shop where off site welding is taking place.
- I. Any welder failing more than 5% of his welds is subject to removal from the project.

3.05 PIPE SUPPORTS:

- A. Pipe supports shall meet the design and location requirements of ASME B31.3 and shall be types as detailed.
- B. Support locations are specified on the drawings for piping 3" and larger only based on the pipe routing shown. Should the Contractor change the pipe routing, the Contractor shall revise the pipe support locations accordingly and submit for review prior to beginning fabrication.
- C. Pipe supports for piping 2-1/2 inches and smaller shall be field located. Spacing shall be in accordance with ASME B31.3 from which the following table is derived:

Pipe Diameter (nominal inches)	Maximum Support Spacing (feet)
3/4"	6'
1"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'
6"	17'
8"	19'

- D. Where changes in direction occur, reduce the spacing allowed in ASME B31.3 by threequarters.
- E. Furnish and install all rigid supports, whether or not they are shown and detailed, but are required to adequately support the piping systems. Include all necessary structural steel, brackets, anchor bolts, etc., which are required to properly support the piping systems.
- F. Large bore (3" and larger) pipe supports shall be complete factory fabricated and hot dip galvanized assemblies.
 - 1. Pipe support shall have adjustable height flat plate support with two U-bolts and an integral baseplate with slotted anchor rod holes.
 - 2. U-bolts and nuts shall be galvanized. U-bolts shall also be coated with heat shrink liner to prevent metal to metal contact between U-bolt and piping being supported.
 - 3. Each U-bolt shall be spanned above flat plate, with an I-Rod liner of standard temperature rating.
 - 4. Pipe support assemblies shall be as manufactured by EZ Line Figure FIR or approved equal.
 - 5. Elbow pipe support assembles shall have cradle support with two galvanized and heat shrink coated U-bolts. The cradle assembly shall have I-Clip Liners.
 - 6. Pipe shoes with hold down clamps shall have I-Clip lining of the clamps and a slide plate of PTFE permanently bonded to the bottom of the WT flange. PTFE slide plate shall extend to within ½" of edge of WT bottom surface.
 - 7. Pipe shoes welded to the pipe shall be of the same material as the pipe. A slide plate of PTFE shall be permanently bonded to the bottom of the WT flange. PTFE slide plate shall extend to within $\frac{1}{2}$ of edge of WT bottom surface.
- G. Pipe supports shall be anchored as detailed, using ASTM F1554 Gr 36, hot dip galvanized threaded rod. Nuts shall be ASTM A563, Grade DH heavy hex carbon-steel nuts, hot dip galvanized. Washers shall be ASTM F436, Type 1, hardened carbon steel washers, hot dip galvanized. Anchor rod sizes and embedment shall be as detailed.
 - Install the anchor rods using the Hilti RE 500 V3 system. The embedment hole MUST BE cleaned prior to installing the epoxy and anchor rod per the manufacturers installation instructions, utilizing a compressed air gun at 90 psi, with tip that extends to bottom of hole, and steel wire "bottle" brushes. Follow manufacturers data for temperature based full cure times before loading the anchor rods.
 - 2. Clean the concrete surface immediately below baseplate of any loose material or bond breaking material and roughen the surface. Confirm that the bottom of the base plate is clean. Install the pipe support and level the base plate using the leveling nuts so that the vertical member of the pipe support is level in both planes. Install the washer and anchoring nut and snug tighten.
 - 3. Install minimum 5,000 psi non-shrink grout between the baseplate and the concrete slab. Pack the material tightly into place, assuring that no voids are present. Finish the edges of the grout as detailed and tool to a smooth finish.
 - 4. After the grout is fully cured, torque the anchoring nut per the manufacturer's data provided for each diameter of anchor rod.
- H. Small bore (2-1/2" and smaller) pipe supports shall be field assembled, utilizing a metal framing system by Unistrut, B-Line, or Grinnell.
 - 1. Channel sections shall be 1-5/8" pre-galvanized carbon steel, model P1000T with slotted holes to accommodate anchoring to the concrete slab. Vertical members shall be capped with Model P1180 electrogalvanized caps.
 - 2. Bases for vertical channel sections shall be electrogalvanized Model P2072ASQ, with a 4hole base plate and a vertical member with two holes to install a galvanized bolt through the vertical channel section is two locations.
 - 3. Pipe clamps shall be Cush-A-Clamps with electrogalvanized straps and a UV-resistant elastomer cushion. Tighten the shoulder bolt sufficiently to compress the cushion around the pipe.

- 4. Vertical channel section bases, and horizontal channel sections shown mounted directly to the concrete slab, shall be installed using ¼" threaded rod and hardware conforming to the material specifications in Paragraph 3.06.H above.
- I. Observe the flushing system in operation and make adjustments as necessary to support the system under dynamic loads.

3.06 SAFETY PRECAUTIONS AND FUEL SYSTEM MODIFICATIONS:

- A. Safety procedures are the responsibility of the Contractor. All operations in the construction area that involve open flames or the possibility of arcing or sparking shall be conducted in a "Gas-Free" condition.
- B. It shall be the responsibility of the Contractor to monitor the use and suitability of the equipment and procedures on the job and maintain a safe "Gas-free" condition when necessary during construction.
- C. Prior to commencing any phase of the work requiring a gas-free condition, the Contractor shall make the following minimum provisions:
 - 1. Empty pipes containing fuel and purge all vapors.
 - 2. Isolate, blank off, and adequately ventilate open piping sections so that no part of the pipe containing fuel or vapors is exposed.
 - 3. Inspect for, and confirm that there are no open pools of fuel, or soil contaminated to a combustible limit, in the area of the work.
 - 4. Drain and ventilate storage tanks prior to working on the tanks or tank connections.
- D. Utilize a combustible gas analyzer or similar device to make certain that concentrations of combustible gas do not exist in the construction area when performing these operations.
- E. Perform all safety precautions as required to assure that the work is conducted in a safe manner and to conform to applicable codes.

SECTION 335243.15 FUEL SYSTEM GENERAL VALVES

PART 1 - GENERAL

1.01 SUMMARY:

- A. This section of the specification includes general valves for use in isolating various segments of the fuel system.
- B. This section also includes motor operators.
- C. General valves specified in this section include the following:
 - 1. Ball Valves
 - 2. Butterfly Valves
 - 3. Wafer Check Valves
 - 4. Flanged Insert Check Valves
 - 5. Pressure/Thermal Relief Valves
 - 6. Solenoid Valves
 - 7. Anti-siphon Valve
 - 8. Foot Valve

1.02 RELATED SECTIONS:

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- E. Section 335243.16 Aviation Fuel Control Valves
- F. Section 335243.21 Fuel System Metering Equipment
- G. Section 335243.23 Fuel System Pumps
- H. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- I. Section 335243.28 Fuel System Filtration
- J. Section 335243.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems
- K. Section 335243.32 Aboveground Aviation Fueling Tank Dispensing Skid
- L. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES:

- A. American Petroleum Institute (API)
 - 1. 6D Specification for Pipeline Valves
 - 2. 6FA Specification for Fire Test for Valves
 - 3. 607 Fire Test for Soft-Seated Quarter-Turn Valves
 - 4. 609 Butterfly Valves: Double Flanged, Lug and Wafer-Type
- B. American Society of Mechanical Engineers
 - 1. 16.34 Valves Flanged , Threaded, and Welding End.
- C. Underwriters Laboratory (UL)
- D. Oil Companies Materials Association (OCMA)
- E. American Society of Mechanical Engineers (ASME)
- F. Factory Mutual (FM)

1.04 SUBMITTALS:

- A. Submit as specified in Section 01 33 00.
- B. Product Data
 - 1. Ball Valves
- 335243.15 Fuel System General

Valves

- 2. Butterfly Valves
- 3. Wafer Style Check Valves
- 4. Flanged Insert Check Valves
- 5. Pressure/Thermal Relief Valves
- 6. Anti-Siphon Valve for water draw off
- 7. Double Block and Bleed Plug Valves
- 8. Foot Valve
- 9. Solenoid Valve for anti-siphon
- C. Quality Assurance
 - 1. Test Reports
 - 2. Manufacturer's Instructions
- D. Closeout Submittals
 - 1. Warranty

1.05 QUALITY ASSURANCE:

- A. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- B. The valve manufacturer(s) shall have products in satisfactory use in similar applications for a minimum of five years.

PART 2 - MATERIALS

2.01 BALL VALVES :

- A. The valve shall be Flow-Tek Model F15 or approved equal. The valve shall be of two-piece full port ball valve. The valve shall have a rated working pressure no less than 275 psi, and shall have a working temperature range of at least -20 degrees F to 300 degrees F.
- B. Valves shall consist of stainless steel, two part assembly with replaceable body seal of SS316/Graphite. The ball and stem shall be 316 Stainless Steel. The replaceable ball seat shall be 15% RPTFE or TFM 1600 and stem packing shall be constructed of Graphite.
- C. Valves shall have a "fire safe" rating per API 607.
- D. Valves shall have a lever type handle and a 90-degree stop on the extended stem. Handle shall be suitable for padlocking in both the open or closed position.
- E. Where indicated on the Drawings, valves shall be equipped with spring return devices in the actuator as part of the manufacturer's complete assembly.
- F. All valves shall have ANSI Class 150 raised face flanged connections.

2.02 BUTTERFLY VALVES:

- A. Butterfly valves shall be used for bi-direction bubble-tight shut-off of flow within the system. Valves shall be mounted between ANSI Class 150 flanges with rated working pressure of the valve to be not less than 275 psi.
- B. The valves shall have a carbon steel ASTM, A216 full lug body, drilled and tapped lugs, 316 ASTM stainless steel disc, stainless steel stem, and 316 stainless steel seat with TFE insert material. The operator shall be a spring loaded 10-position manual operator with locking device for valves 4" or smaller and a self locking wormgear operator for valves 6" or larger.
- C. Valves shall have a "fire safe" rating per OCMA and/or API 607.
- D. Valves shall be WKM "Dynacentric", Posi-Seal "Phoenix III", FlowSeal "Fire-Flow", or approved equal.

2.03 LUG STYLE CHECK VALVES:

A. Lug style check valves shall be used on all piping 1-1/2" to 10".

- B. Check valves shall be used to limit flow to one direction in the system. Valves shall be bubbletight spring-loaded, non-slamming, silent closing type rated for not less than 285 psi working pressure at 100 degrees F.
- C. The valves shall be manufactured with renewable seat and disc. Disc shall be guided at both ends, body shall be carbon steel with stainless steel trim. Valve body shall have drilled and tapped lugs. Valves shall be suitable for installation between ANSI Class 150 raised face flanges. Valve shall not have a retainer ring in the seating area of the gasket or anything that reduces the gasket seating face. Valve shall be Titan CV42L-CS with a viton seat or approved equal.

2.04 FLANGED INSERT CHECK VALVES

- A. Flanged insert check valves shall be used on all small bore piping 1" and smaller.
- B. Check valves shall be used to limit flow to one direction in the system. Valves shall be rated for not less than 285 psi working pressure at 100 degrees F.
- C. The valve shall have a stainless steel body, viton seat, and stainless steel spring with a 0.500 psi spring cracking pressure. Valves shall be suitable for installation between ANSI Class 150 raised face flanges. Provide a flag tag to indicate the check valve is present in the piping.
- D. Valves shall be manufactured by Check-All Valve Mfg. Co. or approved equal.

2.05 PRESSURE/THERMAL RELIEF VALVES:

- A. Pressure and temperature relief valves shall be used to relieve pressure increases within the piping system due to thermal changes in the piping system. The valves shall be designed, constructed, and shall be labeled in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code. Valves shall relieve at pressure indicated on drawings. Operating pressure shall be adjustable by means of an enclosed adjusting screw. The valves shall have a minimum capacity of 20 gpm at 10 percent overpressure and shall operate at rated capacity with a back pressure not exceeding 50 psi.
- B. The valve body shall be of stainless steel construction with a 1" flanged inlet and 1" flanged outlet. Extend discharge piping full size and as indicated on the drawings.
- C. Valves shall be Taylor Series 8250 or approved equal.

2.06 ANTI-SIPHON VALVE

- A. The water draw-off connection on the horizontal storage tanks shall be provided with an antisiphon valve installed at the tank nozzle. Valve shall prevent the siphoning of water/fuel from the tank and shall require a 1.88 psi differential on the valve to open.
- B. Valve shall be OPW Model 199ASV-2075 or approved equal.

2.07 SOLENOID VALVE FOR ANTI-SIPHON

- A. Solenoid valve shall be an ASCO Series 256 or approved equal.
- B. Solenoid valve shall be located at the highest point in the piping as indicated and shall be normally open. Valve shall close when energized when the bulk skid pump is turned on and in loading or recirculation mode.
- C. Valve shall have stainless steel body with 120V operation. Shall have viton seals and shall have 3/4" NPT connections
- D. Skid manufacturer shall install conduit and cable from solenoid valve to skid control panel per NEC requirements. Wires shall terminate to terminal strip inside control panel for field connection.

PART 3 - EXECUTION

3.01 METHOD OF INSTALLATION:

A. Valves shall be of the same Manufacturer throughout, where possible. Manufacturer's name and pressure rating shall be located on a permanent nameplate on outside of valve.

- B. Valves shall be installed in accordance with manufacturer's recommendations and as indicated on the plans.
- C. Each valve shall be installed in an easily accessible location such that valve operator shall not have to interfere with adjacent equipment for operation and maintenance. Provide spool piping, whether indicated on the drawings or not, if required for proper movement of valve operator and disc.
- D. A union connection shall be installed within two feet of each screw end valve. Valves and specialty items shall be rated for not less than the system pressure.
- E. Replace any and all valves that prove defective during system testing.
- F. Install all butterfly valves with valve shaft in the horizontal position.
- G. Butterfly valves that will be blinded on one side after project completion shall be installed with the seal on the fluid "wet" side of the valve. This is to prevent dry rot of the valve seal should the valve be required for future installations.

SECTION 335243.16 AVIATION FUEL CONTROL VALVES

PART 1 - GENERAL

1.01 SUMMARY

- A. Control valves specified in this section include the following:
 - 1. Water Slug/Flow Control Valve
 - 2. Loading Control Valve
 - 3. Tank High Level Shut-off Valve
- B. All control valves and accessories shall be provided from the same manufacturer.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- D. Section 335243.28 Fuel System Filtration

1.03 REFERENCES

- A. American National Standard Institute (ANSI)
- B. National Electrical Manufactures Association (NEMA)

1.04 SUBMITTALS

- A. Submit as specified in Section 01 33 00 Compliance Submittals
- B. Product Data
 - 1. Control Valves
 - 2. Water Slug/Flow Control Valves
 - 3. Loading Control Valve
 - 4. Tank High Level Shutoff Valve
 - 5. Rate of Flow Control Valve
- C. Shop Drawings
 - 1. Submit instrumentation drawings for control valves
- D. Instructions
 - 1. Overall system maintenance and operation
 - 2. Controls Operation and Service technician point of contact
 - 3. Instructions to installing contractor
 - 4. Commissioning instructions
- E. Quality Assurance
 - 1. Manufactuer's Field Reports
 - 2. Qualification Statements
 - 3. Certifications
- F. Closeout Submittals
 - 1. Commissioning Report.
 - 2. Warranty.

1.05 QUALITY ASSURANCE

- A. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- B. The manufacturers specified within this section shall have products in satisfactory use in similar applications for a minimum of five years.

C. All valves shall be factory tested to verify flow, function and specified control features are satisfied. Provide certification as part of submittals.

PART 2 - MATERIALS

2.01 CONTROL VALVES GENERAL

- A. Control valves include water slug valves, high-level shutoff valves, and flow control valves. The valves shall have ductile iron bodies suitable for 250 PSIG working pressure with ANSI 150 flat-face flanges, and stainless steel trim including seats, guides, control pilots, and tubing systems. For Jet-A fuel, elastomers shall be Buna-N in the main valve and control pilots. For AVGAS fuel, elastomers shall be Viton in the main valve and control pilots. All surfaces in main valve body which are in contact with fuel shall have a 3 mil minimum electrolysis nickel plating. All valves to have enclosed valve stem position indicators. Main valve parts including strainers, valve seat, stem bearings and control system shall be replaceable without removing the main valve from the line. All non-metallic parts shall be replaceable.
- B. The main valve body shall be cast with the pressure class, size, material, foundry heat number and identification, manufacturer and flow pattern.
- C. Brass name plates shall be fastened to the valve. Body name plates shall list the size, model number, stock number, manufacturer/supplier and manufacturer inspection stamp.
- D. Valve size, function, and components shall be as indicated on the layout drawings, equipment details and control valve schematics.
- E. Manufacturers shall be Cla-Val or approved equal.

2.02 WATER SLUG/FLOW CONTROL VALVES

- A. Water Slug / Flow Control Valves include the following valves:
 1. CV101-01, CV301-01, CV302-01, and CV601-01
- B. The valve shall be located downstream of a filter/separator and shall close by system pressure when water is detected in the filter/separator sump. Valve shall be normally closed, flow to open, and shall close within 10 seconds, from a 100% open position. The valve shall limit flow rate to 400 gpm for both Jet-A skids and 200 gpm for the AVGAS skid.
- C. Provide the following trim/accessories:
 - 1. Control pilot for automatic closure with manual override.
 - 2. Single-pole double -throw limit switch for valve position indication mounted in NEMA 4, NEMA 7 enclosure. Entire limit switch assembly shall be mounted within a weatherproof enclosure.
 - 3. Rate of flow pilot with orifice plate on downstream side of main valve and sensing lines completely piped and self-contained on valve. Orifice plate position per recommendation of manufacturer.
 - 4. Opening and closing speed adjustment
 - 5. Integral check feature
 - 6. Provide a strainer in the pressure input line to the diaphragm.
 - 7. The solenoid control tubing shall have a manual override ball valve so that the valve can be opened without control power. The ball valve shall have a locking operator.
- D. Manufacturers shall be Cla-Val or approved equal.

2.03 LOADING CONTROL VALVE

A. The valve shall be located immediately downstream of the loading meter and shall be operated digitally from the loading meter digital controller to control loading flow rate, ramping, and all meter control features and permissives which include deadman and ground verification. Valve shall be operated electrically thru dual solenoids from the digital controller. See Section 40 70 00 Fuel System Instrumentation for details. Loading control valves shall be capable of a programmable low flow start (100 GPM), then ramping up to 400 GPM for both Jet-A skids and 200 gpm for the Avgas skid, until 50 gallons remain in the preset amount and then gradually ramping down to zero and shutoff. Deadman control shall be controlled through the digital controller. as well as interlock with permissives from Load Computer and Deadman.

- B. Provide the following trim/accessories:
 - 1. Opening and closing speed adjustment
 - 2. Valve stem position indicator
 - 3. Valve shall close within 5 seconds, from a 100% open position.
 - 4. Explosion proof, 120Vac control solenoids. De-energizing solenoids shall close the valve.
 - 5. Valve shall digitally limit flow to from 100 to 400 gpm for both Jet-A skids, and 200 gpm for the Avgas skid, for the loading operation. Flow rate will vary depending upon the maximum flow rate provided by the digital controller.
 - 6. Thermal relief control relieving downstream pressure to upstream.
 - 7. Include strainer at the input to the valve diaphragm.
 - 8. The solenoid control tubing shall have manual override ball valves so that the valve can be opened without control power. The ball valves shall have locking operators.
- C. Manufacturers shall be Cla-Val or approved equal.

2.04 TANK HIGH LEVEL SHUTOFF VALVE

- A. The valve shall be located in the fill piping and mounted at the tank fill connection and be designed to close by fluid pressure when the designated level in the tank reaches the "Hi-Hi" condition.
- B. Provide the following trim/accessories:
 - 1. Normally open, fuel level to close, non-throttling type
 - 2. Integrated reverse flow-check valve feature
 - 3. Opening and closing speed control
 - 4. Mount float pilot Model Cla-Val CFM2 internal to tank on the drop tube. Control tubing shall pass through the full coupling on the manway neck.
- C. Manufacturers shall be Cla-Val or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish the services of an experienced service engineer for a minimum of five days on the jobsite to verify proper installation and assist in start-up, check-out and calibration. Allow for two separate trips to the jobsite if required by the construction schedule.

SECTION 335243.21 FUEL SYSTEM METERING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Components specified in this section shall address the metering equipment to be used in the receipt and transfer of Jet-A and Avgas aviation fuel.
- B. Meters and metering equipment specified in this section include the following:
 - 1. Jet-A Unloading and Loading Meter
 - 2. Avgas Loading Meter

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)
- C. American Petroleum Institute (API)
 - 1. 1130 Computational Pipeline Monitoring for Liquid
 - 2. Chapter 5 Metering
- D. American Society of Mechanical Engineers (ASME)

1.04 SUBMITTALS

- A. Submit as specified in Section 01 33 00.
- B. Product Data
 - 1. Jet-A Unloading and Loading Meters
 - 2. Avgas Loading Meter
- C. Instructions
 - 1. Overall maintenance and operation
 - 2. Instructions to installing contractor
 - 3. Commissioning instructions
- D. Quality Assurance
 - 1. Design Data
 - a. Calculations from manufacturer verifying operation
 - 2. Test Reports
 - a. Third party meter calibration
- E. Closeout Submittals
 - 1. Commissioning Report.
 - 2. Warranty.

1.05 QUALITY ASSURANCE

- A. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- B. The equipment shall be manufactured by a company regularly engaged in the manufacturer of the devices specified herein, and whose products have been in similar service for a minimum of 5 years.

335243.21 - Fuel System Metering Equipment

PART 2 - MATERIALS

2.01 400 GPM UNLOADING AND LOADING METERS

- A. All meters shall be Liquid Controls MSAA Series, or approved equal.
- B. Meters shall be of the single-case, positive displacement, capable of metering jet fuel at a flow rate of 400 gpm with an accuracy of 1/4 of 1 percent.
- C. Construction shall be an outer housing and cover of cast steel, Viton seals seals with 4-inch 150-pound raised-faced flanged connections.
- D. Accessories shall include automatic temperature compensation, universal pulse transmitter.

2.02 200 GPM AVGAS LOADING METER

- A. All meters shall be Liquid Controls MSAA series, or approved equal.
- B. Meters shall be of the double-case, positive displacement, straight through design capable of metering Avgas at a flow rate of 200 gpm with an accuracy of 1/4 of 1 percent.
- C. Construction shall be an outer housing and cover of cast steel, Viton seals with 3-inch 150pound raised-faced flanged connections.
- D. Accessories shall include automatic temperature compensation, universal pulse transmitter.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Furnish the services of an experienced service engineer for a minimum of two days on the jobsite to verify proper installation and assist in start-up, check-out and calibration. Allow for two separate trips to the jobsite if required by the construction schedule.
- B. Provide third party meter proving agency to verify calibration of all meters at start-up.

SECTION 335243.23 FUEL SYSTEM PUMPS

PART 1 - GENERAL

1.01 SUMMARY:

A. Components specified in this section shall be fuel system pumps to be used for unloading and loading Jet-A aviation kerosene and 100LL Aviation Gasoline.

1.02 RELATED SECTIONS:

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.13 Fuel Pipe, Fittings, and Installation
- E. Section 335243.15 Fuel System General Valves
- F. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- G. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. D910 Standard Specification for Aviation Gasolines
 - 2. D975 Standard Specification for Diesel Fuel Oils
 - 3. D1655 Standard Specification for Aviation Turbine Fuels
 - 4. D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel
- B. American Society of Mechanical Engineers (ASME)
- C. American Petroleum Institute (API):
- D. National Electrical Manufacturer's Association (NEMA).

1.04 DEFINITIONS:

A. Unless otherwise specified, the working pressure ratings as used in these specifications for valves, fittings, unions, and other piping specialties refer to pressure ratings in pounds per square inch above atmosphere (PSIG) in accordance with applicable ASME Standards.

1.05 SUBMITTALS:

- A. Submit as specified in Section 01 33 00 Compliance Submittals.
- B. Product Data
 - 1. Horizontal Self-Priming Centrifugal Pump
 - 2. Hand Pumps
- C. Instructions
 - 1. Overall pump maintenance and operation
 - 2. Controls Operation and Service technician point of contact
 - 3. Instructions to installing contractor
 - 4. Commissioning instructions
- D. Quality Assurance
 - 1. Design Data
 - a. Calculations
 - 2. Test Reports
 - a. Horizontal Self-Priming Centrifugal
 - 1) Manufacturer tests in accordance with standards of the Hydraulic Institute
 - 2) Hydrostatic pressure tests of casings at 150% of max working pressure.
 - 3) Perform dynamic and static balance tests of impellers.
 - 4) Performance curves of head, horsepower, and efficiency at all flowrates from shutoff to 120% of design flow certified by test engineer

- E. Closeout Submittals
 - 1. Commissioning Report.
 - 2. Warranty.

1.06 QUALITY ASSURANCE:

- A. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- B. The pumps shall be manufactured by a company regularly engaged in the manufacturer of the devices specified herein, and whose products have been in similar service for a minimum of 5 years.
- C. The drawings and specifications shall be considered complementary, one to the other, so that materials and labor indicated, or called for, or implied by the one and not the other, shall be supplied and installed as though specifically called for by both.
- D. All materials and equipment provided under these specifications shall be new, unused products of manufacturers regularly engaged in production of such equipment for a minimum of 5 years. All products shall conform to the applicable code or standard for its manufacturing, fabricating and installation.

PART 2 - MATERIALS

2.01 HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMP

- A. Horizontal Self-Priming Centrifugal Pumps include the following pumps:
 - 1. P101 Jet-A Unload Pump
 - 2. P301 and P302 Jet-A Load/Unload Pump
 - 3. P601 Avgas Load/Unload Pump
- B. General Requirements:
 - 1. Pump shall be a horizontal self priming centrifugal pump with external air release head.
 - 2. The pumping units shall be horizontal self-priming centrifugal pump(s) direct connected to an explosion proof motor. The pumping unit and motor shall be factory assembled and mounted on a sturdy fabricated steel base.
- C. Pump Characteristics:
 - 1. The pump shall be of the single stage, horizontal, self-priming type. The design shall consist of a centrifugal impeller combined with an integral variable-capacity vane type priming unit located within the main centrifugal housing. The vane type positive priming unit shall be capable of initially priming the pump and of restoring prime during operation against back-pressures to 8 psig. An automatic air release mechanism shall be available to facilitate operation in systems when back-pressure greater than 8 psig. is present. The vane pump shall be positively driven by the main pump shaft. No gears or belts shall be required to operate the priming pump. The design of the pump shall be such that all rotating parts of the pump may be removed without disconnecting the suction or discharging piping. The pump shall develop an efficiency of not less than 50 percent when operating at full rated capacity and with normal fluid pumping temperatures.
- D. Construction
 - 1. Pump Casing:
 - a. The pump casing shall be constructed of ductile iron. It shall consist of means for mounting on the pump and motor base, flanged suction and discharge connections, and shall have provisions for attaching a vacuum gauge on the suction side and a pressure gauge on the discharge side. The suction flanges shall be faced and drilled to the 150 pound ANSI standard.
 - 2. Impeller:
 - a. The impeller shall be of the closed type, be statically and dynamically balanced. The impeller shall be constructed of Aluminum Alloy SG70A-T6. The net positive suction head required at the center of the impeller shall not exceed 9 feet.

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- 3. Pump Shaft Seal:
 - a. The pump shall be fitted with a mechanical-type seal for closure between the stationary pump case and the pump shaft. The seal shall be capable of effectively sealing a pressure equal to 1 ½ times the pump shut off head. The mechanical-type shaft deal shall be a standard product of proven material and design. The sealing surface shall be self-aligning and shall be readily removable for repair or replacement without removing the electric motor from the base. The sealing surfaces shall be John Crane Type 48 or equivalent. The rotating member shall be pin driven by the pump shaft, or shall be firmly retained on the pump shaft by a snap ring or other suitable means. Materials used as sealing members or elastomers shall be impervious to the deleterious action of the specified product. All parts of the seal shall be resistant to corrosion and oxidation.
- 4. Pump Shaft:
 - a. The pump shaft shall be fabricated from AISI 1045 material. The shaft shall be turned, ground and polished, and hardened to resist wear where the shaft passes through the seal and bearings. The shaft shall be supported in the shaft housing by means of heavy duty, anti-friction, sealed type ball bearings.
- 5. Shaft Coupling:
 - a. The pump shaft shall be coupled to the motor shaft by means of a flexible coupling having sufficient torsional strength to accommodate the rated motor horsepower. The coupling shall be capable of handling angular and non-parallel alignment.
- 6. Motor:
 - a. The motors shall be horizontal mounted, totally enclosed, fan cooled, explosion-proof, constant speed type with Class A insulation designed for continuous duty and rated for a minimum of 6 starts per hour. The motor shall be suitable for use in Class I Group IIA, Zone 1 and operate with a clockwise rotation when observing the pump unit from the shaft end. The motors shall be suitable for Class I Group D and Class II Group F and G or E, F, and G hazardous locations. The motor horsepower shall be suitable to operate the pump unit with the specified impeller and shall not be overloaded throughout the performance curve.
- 7. Motor Starter:
 - a. The motor starters shall be installed on the skid as specified in Section 33 52 43.31 Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems and shall be mounted in the control panel.
- 8. Voltage:
 - a. The motors shall be designed to operate on 480 Vac, 3 phase, 60 Hz with 120 Vac, single phase space heaters.
 - b. The synchronous speed of the motors shall be 3450 R.P.M.
- E. Service Nameplate: A pump service nameplate, of type 18-8 stainless steel or monel, securely attached by stainless steel pins at an easily accessible point on the pump, shall be furnished in addition to the identification nameplate. The pump service nameplate shall be stamped with the following information:
 - 1. Manufacturer's name.
 - 2. Serial number of pump.
 - 3. Capacity, gpm.
 - 4. Pumping head, ft.
 - 5. Maximum specific gravity of fluid to be pumped.
 - 6. Revolutions per minute.
 - 7. Horsepower of driver.
- F. Operating Conditions for P101 Pump
 - 1. Capacity:400 GPM Flow controlled, will not exceed 400 GPM.
 - 2. Total Head:191 feet (Worst Case)
 - 3. Fluid pumped: Jet Fuel
 - 4. NPSH availble at suction nozzle: 30 feet
 - 5. Minimum pump efficiency: 60 %

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- 6. Maximum pump speed: 3450 RPM
- 7. Minimum fluid temerature: 25 degrees F
- 8. Maximum fluid temperature:125 degrees F
- 9. Motor horsepower: 30 hp, Motor service factor: 1.15
- 10. Site Elevation: 1050 feet
- G. Operating Conditions for P301 and P302 Pumps
 - 1. Capacity:400 GPM Flow controlled, will not exceed 400 GPM.
 - 2. Total Head:241 feet (Worst Case)
 - 3. Fluid pumped: Jet Fuel
 - 4. NPSH available at suction nozzle: 17 feet
 - 5. Minimum pump efficiency: 60 %
 - 6. Maximum pump speed: 3450 RPM
 - 7. Minimum fluid temerature: 25 degrees F
 - 8. Maximum fluid temperature:125 degrees F
 - 9. Motor horsepower: 40 hp, Motor service factor: 1.15
 - 10. Site Elevation: 1050 feet
- H. Operating Conditions for P601 Pump
 - 1. Capacity:200 GPM Flow controlled, will not exceed 200 GPM.
 - 2. Total Head:229 feet (Worst Case)
 - 3. Fluid pumped: AVGAS
 - 4. NPSH available at suction nozzle: 20 feet
 - 5. Minimum pump efficiency: 50 %
 - 6. Maximum pump speed: 3450 RPM
 - 7. Minimum fluid temerature: 25 degrees F
 - 8. Maximum fluid temperature:125 degrees F
 - 9. Motor horsepower: 20 hp, Motor service factor: 1.15
 - 10. Site Elevation: 1050 feet

2.02 HAND PUMP

- A. General requirements
 - 1. Pump(s) shall be hand operated piston style pump. Pump shall be used a water draw-off pump on horizontal aboveground storage tanks.
 - 2. The pumps and components shall be suitable for pumping aviation Jet Fuel and 100LL Aviation gasoline.
 - 3. FM approved for handling Class I and Class II flammable and combustible liquids. Hand pump(s) shall be Fill-Rite Model FR150 or equal.
- B. Construction
 - 1. Materials (Piston Style): Pump shall be of cast aluminum housing construction. Suction pipe o-ring shall be Buna-N.
 - 2. Pump shall have ³/₄-inch NPT connections.
 - 3. Exterior Primer Coat: Exterior surfaces of the pump shall be primed by the manufacturer. Surface cleaning shall meet requirements of SSPC SP10. Metal primer shall be zinc rich paint conforming to specification MIL-P-24441 Type 1, Class 3. Dry film thickness shall be 2 to 4 mils.
 - 4. Exterior Topcoat: Manufacturer's Standard exterior topcoat shall be factory applied and shall be white.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Store pumps in a dry location.
- B. Retain shipping flange protective covers and protective coatings during storage.
- C. Protect bearing and couplings against damage from grit, sand, or other foreign matter.
- D. Comply with pump manufacturer's rigging instructions.

E. Connect and operate motor space heaters during storage as recommended by motor manufacturer.

3.02 INSTALLATION:

- A. Pumps shall be furnished and installed with adequate support so that transfer of strain vibration to connecting piping is eliminated.
- B. Provide pump complete with motor, coupling, coupling guard, and mounting base.
- C. Pumps shall have statically and dynamically balanced rotating parts at the factory and after installation.
- D. Replace any and all equipment items that prove defective during testing.

3.03 START-UP, MOTORS AND DRIVES

- A. Check all motors and drives for proper rotation and alignment prior to placing in operation.
- B. Disconnect and realign all coupling before placing into service or testing.
- C. Install oil in all couplings, reducers, etc, prior to start up. Ensure all bearing are lubricated.

3.04 SETTING AND ALIGNING EQUIPMENT

- A. Set and align all equipment supplied under this Section in accordance with manufacturer's recommendations.
- B. Level and true all equipment at the locations indicated. Demonstrate proper leveling of equipment.
- C. Provide coupling alignment records indicating parallel and angular dial indicator readings as well as coupling manufacturer's tolerances. Alignment for pumps, couplings, and drivers requiring "cold" and "hot" settings shall be checked in both conditions and so indicated on the alignment record.
- D. Retighten all bolted connections after installation to the proper torque.

3.05 EQUIPMENT TEST AND CHECKOUT

- A. All equipment shall be tested and demonstrated to be correctly connected and installed before Owner will accept.
- B. All testing and checkout procedures of the manufacturer shall be carried out completely. Contractor shall initial each test of the installation manual and provide to Engineer.
- C. Any equipment found to be defective shall be reported to the Owner immediately.
- D. Any operating difficulty or defective item as a result of Contractor's work shall be repaired or replaced and put into proper operation by the Contractor immediately.

3.06 MANUFACTURER'S SERVICE ENGINEER

A. Provide the services of manufacturer's representative (factory trained) for one (1) day on the site to certify proper installation (or assign repairs), assist in startup, and provide training of Owner's operating personnel.

SECTION 335243.24 FUEL SYSTEM INSPECTION, TESTING, AND FLUSHING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section of the specifications describes inspection of all fabrication, assembly and installation performed to construct the Jet-A and AVGAS fuel systems as shown on the contract Drawings.
- B. Testing of all fuel system controls, operations, equipment and systems.
- C. Flushing of all piping and equipment within the system.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.24 Fuel System Inspection, Testing, and Flushing
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- E. Section 335243.15 Fuel System General Valves
- F. Section 335243.16 Aviation Fuel Control Valves
- G. Section 335243.21 Fuel System Metering Equipment
- H. Section 335243.23 Fuel System Pumps
- I. Section 335243.28 Fuel System Filtration
- J. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. D910 Standard Specification for Aviation Gasolines
 - 2. D1655 Standard Specification for Aviation Turbine Fuels
 - 3. D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel
- B. American Society of Mechanical Engineers (ASME)
 - 1. B31.3 Process Piping.
 - 2. PCC-2-2015 Repair of Pressure Equipment and Piping
- C. American Petroleum Institute (API):
 - 1. Spec 5L Line Pipe.
 - API RP 1110 Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide.
 - 3. Std. 2015, Safe Entry and Cleaning of Petroleum Storage Tanks.
- D. American Welding Society
- E. Energy Institute Standards (EI)
 - 1. El 1581 Specifications and Laboratory Qualification Procedures for Aviation Fuel Filter-Water Separators
 - 2. El 1590 Specifications and Qualification Procedures for Aviation Fuel Microfilters
 - 3. El 1596 Design and Construction of Aviation Fuel Filter Vessels
- F. National Electrical Manufacturer's Association (NEMA)
- G. Laboratory listing services for specific methods of construction, fabrication and assemblies shall be as specified in Section 335243.00 Fuel System General Provisions.
- H. American National Standards Institute (ANSI)

1.04 SUBMITTALS

A. Submit as specified in Section 01 33 00.00 - Compliance Submittals.

335243.24 - Fuel System

Inspection, Testing, and Flushing

- B. The Contractor shall develop, submit for review and approval, written plans for all testing and flushing.
- C. Instructions
 - 1. The testing and flushing plans shall include but, not be limited to the following:
 - a. Identification of system or component
 - b. Temporary piping, pumps and filtration equipment to be used during Event
 - c. Date and time to be performed
 - d. Method and Description of Event
 - e. Coordination of approvals
- D. Quality Assurance
 - 1. Test Reports
 - a. Weld integrity test results
 - b. Pneumatic test results
 - c. Hydrostatic test results
 - d. NACE coating inspection and test results
 - e. Conclusions and recommendations
 - 2. Qualification Statements
 - a. The Contractor shall submit for examination by the Engineer's Representative, qualifications of the personnel to be utilized in testing and flushing prior to proceeding.
 - 3. Certifications
 - a. All inspections, testing and flushing tasks shall be recorded and certified by the Contractor and shall include the signatures of the personnel involved.
- E. Closeout Submittals
 - 1. Comissioning Report

1.05 QUALITY ASSURANCE:

- A. All tests shall be performed in accordance with the applicable codes, standards, and Contract Documents.
- B. All Work, as specified herein, shall be observed by the Engineer's Representative. Contractor shall provide at minimum 7 days notice of all planned weld integrity tests, pneumatic pressure tests, hydrostatic pressure tests, inspection of pipe coatings, flushing, soak tests, and system testing.

PART 2 - MATERIALS

2.01 EQUIPMENT

- A. The Contractor shall provide all necessary devices to test the completed piping system. Items shall include but, not be limited to the following:
 - 1. Air compressors
 - a. Air compressors shall be equipped with condensate dryer system and filter capable of generating oil-free air at -20 degrees F dew point.
 - b. Air compressors shall have sufficient capacity to bring the system pressure in a maximum of 60 minutes.
 - 2. Pressure and temperature recorders
 - a. Provide certified and calibrated test instruments capable of recording direct temperature, pressure and time in the same scale and chart.
 - b. Submit data for test instruments and certificates of calibration. Calibration certificates must be dated within one year of test date.
 - c. In lieu of circle chart recorders, calibrated transmitters can be used and the electronic data collected can be submitted in tabular form. Provide a certified copy of test data.
 - 3. Deadweight Tester
 - a. A calibrated deadweight tester shall be used along with the circle chart recorder or transmitters, to provide continuous calibration.

- b. Submit literature and calibration certificate on deadweight testers. Calibration certificates must be dated within one year of test date.
- 4. Temporary piping
 - a. Provide all piping, fittings, valves, gauges, hoses, pumps, filters, tanker vehicles and equipment required to test and flush and inspect all segments of the system.
- 5. Pumps
 - a. Pumping capability shall be provided by the contractor to flush the system as described in this specification.
- 6. Electronic Holiday Detectors
- 7. Temporary Filtration
 - a. Filter vessels complying to Energy Institute Specifications

2.02 FUELS

- A. The Contractor shall perform hydrostatic testing of the new Jet-A pipe. The Contractor will provide the Jet A fuel required for the hydrostatic testing. The fuel shall meet ASTM D1655, latest revision specification for Jet A Type Aviation Turbine Fuel.
- B. The Contractor shall perform hydrostatic testing of the new AVGAS pipe. The Contractor will provide the Avgas fuel required for the hydrostatic testing. The fuel shall meet ASTM D910, latest revision specification for Avgas Type Aviation Turbine Fuel.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor shall be responsible for completing all inspection, testing, and flushing procedures as outlined in this specification for the complete fueling system as a whole.
- B. The Contractor shall be responsible for the operation of all permanent and temporary equipment and systems and conduct all performance tests in a safe and effective manner. The Contractor shall provide all the necessary equipment, tools, media and labor required for the proper performance of the tests.
- C. The Contractor shall be responsible for the procurement and delivery of all fuel required for testing and flushing. The fuels to be purchased shall be Jet-A per ASTM D1655 Jet-A and AVGAS.
- D. Water shall not be used for the testing and flushing of any fuel piping or components.
- E. The Contractor shall be responsible for establishing all testing procedures and shall demonstrate operation completed "system" to the Owner and Engineer at the time of commissioning.
- F. Upon completion of system testing and flushing, the fuel shall be tested to determine cleanliness and adherence to each fuels specific ASTM standards. The fuel that is determined acceptable for use, shall be retained in storage. In the event the fuel is unacceptable for use, it must be removed from the system and site at the Contractor's expense. The contractor shall observe diligent care not to waste, spill, or contaminate the fuel. The cost of fuel spilled, wasted, or contaminated shall be paid for by the Contractor at the Owners purchase rate times a 1.20 multiplier. The Contractor shall also be responsible for any and all required clean up caused by their spill at no additional cost. The Contractor will receive a credit for this fuel on the final payment of this Contract.

3.02 WELD INTEGRITY TESTING

A. All butt welds for field and shop fabricated piping for belowground installation (including those welds within a pit/vault) shall be 100 percent radiographed. All steel socket welds for field and shop fabricated piping for installation within a pit or vault, shall be 100 percent magnetic particle inspected. Ten percent (10%) of all aboveground piping welds shall be inspected by a third party inspector using the following methods: butt welds shall be radiographed and all remaining welds, including socket welds and O'lets, shall be magnetic particle inspected. Stainless steel piping shall be dye penetrant tested in lieu of magnetic particle testing.

- B. Ultrasonic weld testing shall only be used as a secondary test method with prior approval by the Engineer.
- C. Piping where factory welds have been performed, must also be radiographed or tested by an approved testing laboratory with results provided to the Contractor upon delivery and receipt of the piping. Forward results of the testing to the Owner and Engineer.
- D. All weld integrity-testing costs, including test reports and interpretation, are the responsibility of the Contractor. An independent testing laboratory employed by the Contractor, and subject to approval by the Owner and Engineer, shall perform the weld integrity testing. All testing shall be performed in accordance with ASME B31.3. Execution and testing of welds shall not be performed per API-1104.
- E. All welds shall be left exposed until radiographed, processed, and certified. Any weld that is determined to be defective by the testing laboratory shall be repaired in accordance with ASME B31.3. The Contractor shall be responsible for all costs associated with the weld repair.
- F. One film negative of each radiograph shall be made. Each negative shall be identified as to location. Negatives shall be turned over to the Owner at the end of the project. An expert interpretation by a recognized testing laboratory shall be submitted in report form for every weld to the Owner and the Engineer throughout the progress of the work. The report shall show date of test, location, area, film number, weld number and other pertinent information. Weld numbers and weld location shall be clearly indicated on final As-Built fabrication layout drawings for future identification.
- G. Temporary radiographic identification markings shall be located on the piping near the welds. Do not use identification stamps. Contractor shall temporary identify welds with a paint pen or permanent marker. This identification shall be removed in the final coating process after acceptance testing.
- H. The Independent Laboratory making the tests shall interpret test results and any defects found shall be repaired by the Contractor and a new radiograph taken of the repair. The cost for inspection of defective welds shall be the responsibility of the Contractor at no cost to the Owner.
- I. The Contractor shall coordinate the weld integrity testing with the testing lab, making certain that adequate notices are given that the welds are available for testing.
- J. Backfilling of the piping shall not commence until tests have been approved by the Engineer and pressure tests have been completed.

3.03 PNEUMATIC PRESSURE TESTING OF FUEL PIPING

- A. General: The entire newly installed, fuel distribution piping shall be pneumatically pressure tested after all joints are completed, in accordance with ASME B31.3. Contractor shall perform test at the completion of each phase prior to backfilling belowgrade piping operations where feasible. Sections of the system may be tested and accepted in order to expedite the work or are required due to phasing requirements. These sections shall be tagged by the Contractor to indicate compliance with the tests.
- B. Contractor shall be aware of, and follow, all pressure testing requirements from the manufacturer of the belowground flexible piping.
- C. Pnuematic pressure tests of primary and secondary piping of the flexible piping is required prior to backfilling. Contractor shall verify pneumatic test procedures comply with the manufacturers recommended testing procedures.
- D. Contractor shall submit testing plan which includes the following:
 - 1. Identify the test segments inlcuding length and volume of piping
 - 2. For underground piping installations, identify if piping will be in the pipe trench during the test or if it will be staged aboveground next to piping trench. Identify all surrounding hazards or safety precautions to be taken. The following link may be used to determine the safe distance per ASME PCC-2. https://www.piping-world.com/safe-distance-and-stored-energy-calculator-pneumatic-test
- 3. Identify the proposed test pressure to ensure the test segment results in a maximum stored energy equating to a safe distance of 100 ft or 30m per ASME PCC-2-2018 Section 501-III-1(a) and ASME PCC-2-2018 Section 501-III-1(b) with a maximum test pressure not to exceed 100 psig.
- E. Install temporary closures or other fittings, including plugs, weld caps, blind flanges, etc., as necessary to facilitate the testing process.
- F. Equipment, which is not rated by the manufacturer for the test pressure, shall be removed or isolated prior to testing. Install temporary connections as necessary. All permanent butterfly and plug valves and equipment, which are rated at the test pressure or greater, shall be in place during the pneumatic tests.
- G. Test Procedure: Tests shall be made with clean dry-filtered and oil-free compressed air (-20 degrees F pressure dew point) or compressed nitrogen gas and shall be made in accordance with all applicable codes particularly with regard to safety precautions and the following:
 - 1. A preliminary check of the fuel distribution piping at a test pressure approximately 25% of the final test pressure shall be made.
 - 2. The pressure shall be increased gradually in steps, providing sufficient time to allow the piping to equalize strains during the test, and to be checked for leaks. Final test pressure shall be as calculated per ASME PCC-2-2018 methods identified above. Test duration shall be minimum of 1 hour.
- H. The Contractor shall provide certified and calibrated temperature and pressure instruments and chart recorders and a deadweight tester to provide continuous calibration and direct readings of time, temperature, and pressure on the same scale and chart during the tests. Test Certifications and recorder charts shall be submitted to the Engineer for approval prior to final acceptance of the piping. Calibrated thermocouples may be surface applied to the piping but must be placed in the shade to eliminate the heating effects of direct sunlight. When testing buried piping, the thermocouple shall be placed in the backfill of the piping to obtain a representative temperature of the piping. In lieu of circle chart recorders, electronic data can be submitted using calibrated transmitters. Provide a certified copy of test data.
- I. An acceptable test shall be one in which the pressure and temperature remain stabilized within 10% of the test pressure. A rise in temperature shall result in a rise in pressure and vice versa. Visually inspect all welds as available.
- J. Repair any leaks detected. Retest as described above after all leaks have been repaired. Repeat repair and testing cycles until the system is acceptable to Engineer.
- K. The recordings shall be made after temperature and pressure has stabilized and shall be conducted in accordance with NFPA Codes and API RP1110 and this specification.

3.04 HYDROSTATIC PRESSURE TESTING OF FUEL PIPING

- A. After a successful pneumatic test has been completed, the Contractor shall begin preparation for hydrostatic testing.
- B. The Contractor shall remove all control valves, meters, and other equipment, which are not rated by the manufacturer for the test pressure of 275 psig for steel piping, and 75 psig for flexible piping. Piping spools and blind flanges shall be provided and installed by the Contractor.
- C. Prior to hydrostatic testing, the Contractor shall coordinate with the Fuel System Operator to carefully fill the fuel systems piping with the proper grade of fuel. During the filling process care should be taken to properly vent all high points to disperse all air pockets.
- D. The Contractor will provide the required amount of fuel for the initial line fill and hydrostatic testing.
- E. For all steel piping, hydrostatic shall be as follows:
 - 1. The hydrostatic testing shall be in accordance with ASME B31.3 (latest edition) and shall include a two step process. The initial step will be to gradually bring system pressure up to 100 psig and inspect all joints, components and connections. The second step will be to gradually bring system pressure up to 275 psig and recheck all joints, components, and

connections. The actual test shall be to hold pressure at 275 psig for 4 hours.

- F. For all flexible piping, hydrostatic shall be as follows:
 - 1. The hydrostatic testing shall be in accordance with ASME B31.3 (latest edition) and shall include a two step process. The initial step will be to gradually bring system pressure up to 30 psig and inspect all joints, components and connections. The second step will be to gradually bring system pressure up to 75 psig and recheck all joints, components, and connections. The actual test shall be to hold pressure at 75 psig for 4 hours.
- G. During the testing period, if a leak develops, the Contractor shall abort the test, repair the defect and restart the test from the beginning.
- H. The Contractor shall provide certified and calibrated temperature and pressure instruments and chart recorders and a deadweight tester to provide continuous calibration and direct readings of time, temperature, and pressure on the same scale and chart during the tests. Test Certifications and recorder charts shall be submitted to the Engineer for approval prior to final acceptance of the piping. Calibrated thermocouples may be surface applied. In lieu of circle chart recorders, electronic data can be submitted using calibrated transmitters. Provide a certified copy of test data.

3.05 INSPECTION OF PIPE/TANK COATINGS

- A. The Contractor shall inspect all exterior tank and pipe and joint coatings with a Holiday Tester to locate any damage to the protective coatings during the course of construction.
- B. This element of testing shall take place after all welding and radiographing has been completed, but before any section of belowgrade piping is lowered into the trench.
- C. The inspection shall be performed by using an approved tester at a voltage recommended by the coating manufacturer.
- D. All damaged sections shall be repaired by using the procedures and materials specified in Section 099713.00 Fuel System Coatings.

3.06 SYSTEM FLUSHING

- A. It shall be the Contractor's responsibility to provide the Owner with a complete and functional system. One important aspect of this accomplishment is the interior cleanliness of the piping system. Therefore, this becomes a critical part of the Contractor's responsibility.
- B. The Contractor shall be responsible for providing and installing all temporary manifolds, connections and devices to facilitate the flushing process.
- C. Prior to starting the flushing process, the Contractor shall develop a detailed procedure, sequence and schedule for approval by the Engineer. Flushing procedure shall include
 - 1. A temporary closed loop system for recirulation with Contractor provided temporary piping, pumping, and filtration equipment.
- D. Components such as control valves, strainer baskets, hydrant valves and control devices shall not be in place during flushing.
- E. The desired velocity rate for flushing the Jet-A and AVGAS piping is 10 feet per second to satisfy Airline QA Standards. To accomplish this, the Contractor must provide temporary pumps and filter/separators to supplement the permanent system in order to obtain the desired flow rate and velocity.
- F. A two-test minimum is required to ensure piping cleanliness. The system being flushed must be displaced with clean fuel prior to taking second test.
- G. Acceptance Specifications:
 - 1. Visual All fuel samples must be clear and bright. Other visual clues must be observed and acted upon accordingly, i.e.; feel, color, odor, etc. This test shall be performed with a minimum of 1 gallon of each fuel used in the system.
 - 2. Perform a membrane test per ASTM D2276 for the Jet-A system. A minimum of 1 gallon of jet fuel shall be used for this test. Membrane shall be dried and visually compared with a color rating booklet. The color shall be a maximum of A2, B2, or G2 with a particulate contamination not exceeding the B scale on the shell particle assessment guide. Flushing

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shall continue and the membrane test repeated, until a sample is obtained which meets these requirements. Note: If color rating exceeds the above limits or is in dispute, a matched weight gravimetric rating not to exceed 0.5 mg/lshall govern.

- 3. Perform a membrane test for AVGAS to ensure no particulate contamination using the milipore connections. A minimum of 1 gallon of AVGAS fuel shall be used for this test. Membrane shall be dryed and examined for particulate. Particulate contamination shall not exceed the B scale on the shell particle assessment guide as outlined in ASTM D2276. Flushing shall continue and the membrane test repeated, until a sample is obtained which meets the particulate requirements of ASTM D2276. Note: Color rating test of ASTM D2276 is not valid for AVGAS.
- 4. Water 15 ppm maximum.
- 5. Water Separation (MSEP) Rating 85 minimum [ASTM D7224] OR Water Separation (WSI) Rating 88 minimum [ASTM D8073].
- H. Final Acceptance:
 - 1. It shall be the responsibility of the fuel system operator, or his designee, to have final decision on system cleanliness and acceptance before aircraft fuel servicing is permitted.
- I. After flushing has been completed and approved, the Contractor shall remove all temporary cross connections, spool pieces, etc., and install control valves, metering elements, strainer baskets, etc. The Contractor shall also be responsible for replacing all filter media and cleaning the interior of aboveground fuel storage tanks and filter vessels after flushing has been completed so that the entire facility may be received in a new and clean condition. Additionally, the tanks shall be inspected visually following the flush. The Contractor shall be responsible for cleaning the tank if deem required by the Owner.

3.07 SYSTEM TESTING

- A. After all individual devices and components have been tested and after the piping system has been tested and flushed, the Contractor shall perform overall operational system tests. It shall be the responsibility of the Contractor to debug, test and verify operation of the installed systems in complete conformance to itemized functions of each component and system as identified throughout Division 9, 26, 33 and 40.
- B. The Contractor shall be responsible for establishing all testing procedures and shall demonstrate operation of each completed "system" to the Engineer, Operator and the Owner. Each demonstration may be video recorded by the Owner at his discretion.
- C. All tests shall be witnessed by representatives of the Engineer. The Contractor shall notify the Engineer at least 7 days in advance of the approximate proposed date of test followed by no less than 48 hours advance notice.
- D. All instruments required to conduct the tests shall be furnished and operated by the Contractor using experienced and qualified personnel.
- E. At a minimum, the following tests must be completed:
 - 1. Operating Tank Low Level Alarm
 - a. Position valves to transfer fuel between operating tanks. Start one fueling pump and pump sufficient fuel out of the first operating tank to allow the low level alarm to activate and to stop the fueling pump. This procedure shall be repeated for the second tank until the low level alarm activates and stops the fueling pump due to low liquid level in the operating tank. Verify low level alarm lights are illuminated and horn is activated and silenced.
 - 2. Operating Tank High Level Alarm
 - a. Position valves to transfer fuel between operating tanks. Start one fueling pump and pump sufficient fuel into the first receiving tank to allow the high level alarm to annunciate. Verify the level is at or below 90% of tank volume. Verify high level alarm lights are illuminated and horn is activated and silenced.
 - 3. Tank High Level Shut Off valve
 - a. During delivery of fuel, verify the tank high level shutoff valve closes at or before 95% of tank volume at a nominal 200 gpm flowrate to the AVGAS tank and 400 gpm to the

Jet-A tanks.

- 4. Truck Unloading Operation
 - a. Perform a truck unloading operation at the pump skid and verify the operation of the skid, opening speed of control valves, and emergency shutdown. Verify and record flow rates through out the unloading operation.
- 5. Truck Loading Operation
 - a. Perform a truck loading operation at the pump skid and verify the pressure at the truck nozzle and verify the operation of the deadman control. Verify the closing speed of the control valve. Verify and record flow rates and pressure readings throughout the loading operation.
- 6. Water Slug Valve Operation
 - a. While transferring fuel from one tank to another, verify the operation of the water detection float in the filter separator and verify the control valve closes. If the skid control sequence also stops pump, verify this as well.
- 7. Emergency Shutdown
 - a. With one fueling pump circulating fuel through the system, test each "Emergency Stop" pushbutton station to verify that the pump stops.
- 8. Tank Level Indicator Adjustments
 - a. During the filling operation of the operating tanks, adjust and calibrate the tank level indicators including the final setting of the low level and high level alarms.
- 9. Anti-siphon Valves
 - a. Verify proper operation the anti-siphon valves, both mechanical and solenoid valves on the system to ensure proper operation.
- 10. Water Draw Off Hand Pump
 - a. Verify the operation of the water draw off hand pumps to ensure proper suction.
- 11. Sump Separator Testing
 - a. During the performance testing, the sump separator shall be filled from water and fuel sumped from the tanks. After filling vessel, allow time for fuel/water mixture to separate. Verify liquid separation through the system's sight glass. Proper operation includes capability to pump the separated water into the waste tank and capability to pump the separated fuel back to a full operating tank.

END OF SECTION

SECTION 335243.28 FUEL SYSTEM FILTRATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Components specified in this section include the filter vessels used to remove water, particulates from Jet-A and Avgas and consist of the following vessels:
 - 1. Filter Separator
 - 2. Static Relaxation Vessel

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- E. Section 335243.15 Fuel System General Valves
- F. Section 335243.16 Aviation Fuel Control Valves
- G. Section 335243.24-Fuel System Inspection, Testing, and Flushing

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)
- C. American Society of Mechanical Engineers (ASME)
- D. American Petroleum Institute (API)
- E. Energy Institute
 - 1. El 1596: Design and Construction of Aviation Fuel Filter Vessels
 - 2. El 1581 Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators
 - 3. El 1590 Specifications and Qualification Procedures for Aviation Fuel Microfilters

1.04 SUBMITTALS

- A. Submit as specified in Section 335243.00 Fuel System General Provisions.
- B. Product Data
 - 1. Filter Separator
 - 2. Water Detection Probe
 - 3. Water Detection Float Assembly
 - 4. Pressure Relief Valves
 - 5. Differential Pressure Gauge Assembly
 - 6. Millipore Test Connections
 - 7. Dispenser Filter
 - 8. Static Relaxation Vessel
- C. Shop Drawings
 - 1. Filter Separator
 - 2. Static Relaxation Vessel
- D. Instructions
 - 1. Instructions to installing contractor
 - 2. Commissioning instructions
- E. Quality Assurance
 - 1. Qualification Statements
 - 2. Certifications
 - a. ASME BPV Section VIII Certification

F. Closeout Submittals

1. Warranty

1.05 QUALITY ASSURANCE

- A. No foreign made equipment, fittings, bolts, or any other accessory may be used in this work. All such items shall be American made, manufactured in the United States of America. If any foreign items are found within the work supplied under this contract, the Contractor shall remove and replace them with American made items at no additional charge to the Owner.
- B. The equipment shall be from a company regularly engaged in the manufacturer of the devices specified herein, and whose products have been in similar service for a minimum of 5 years.

PART 2 - MATERIALS

2.01 FILTER SEPARATOR

- A. Filter Separators include the following vessels:
 - 1. FS101 Jet-A Unloading
 - 2. FS301 Jet-A Loading
 - 3. FS302 Jet-A Unloading
 - 4. FS601 AVGAS Loading
- B. The filter separators shall be Facet "Series HCS", Velcon "HV Series" or approved equal. The units shall be of horizontal design capable of removing free and entrained water and solid contaminants in conformance to API/EI 1581 (latest edition), Category C, Type S requirements with two-stage coalescer and separator cartridges at a flow rate of 400 gpm for FS101, FS301, and FS302 seperators and 200 gpm for FS601 filter seperator.
- C. Vessels shall be designed and fabricated of carbon steel in accordance with Section VIII of the ASME Code stamped for 150 psig maximum working pressure with a pressure relief valve set at 125 psig.
- D. Provide two data plates permanently affixed to the vessel. Numbering/lettering shall be engraved to prevent deterioration from UV exposure. One of the data plates shall include model number, conformance to API/EI 1581 (latest edition), Category C, Type S, and ASME Section VIII certification, pressure rating, etc. The other data plate mounted on the vessel shall include model number and number of the coalescer and separator cartridges as well as the torque values for proper installation.
- E. The head closure shall be hinged for swing away access to cartridge elements. The assembly shall include swing-type, cadmium-plated eye bolts attached to the shell compatible with slotted bolt clips attached to the head.
- F. All wettable surfaces and components inside the vessel shall be epoxy coated conforming to El 1541, latest edition and Section 099713.00 Fuel System Coatings .
- G. Coalescer cartridges shall be inside/outside flow. Separator cartridges shall be outside/inside flow. Coalescer cartridge shall be screw mounted style. Cartridge chamber shall be complete with a sloped mounting plate to provide positive draining. Cartridge removal will be from the end of the vessel. Provide a spider plate attached to the vessel body to maintain spacing of the cartridges.
- H. Provide a water defense system. Water detection system shall be via a water detection probe. The probe shall de-energize the solenoid on the water slug valve thereby causing it to close. The probe shall be connected to the PLC to alarm in the event of water detection (and shut down the pump).
 - 1. Water detection probe shall be rated for 150 psi and shall have a full functional test feature allowing water to be introduced into the probe assembly to directly test the probe for alarm functionality, without introducing water into the vessel sump.
 - 2. The Intrinsically Safe (IS) relay shall have a double pole double throw relay contacts rated for 120VAC. The IS relay will be field mounted in an explosion proof enclosure. The explosion proof enclosure for the IS relay shall be factory mounted to the leg of the filter vessel near the discharge flange.

- I. The vessel shall have an air eliminator and check valve as specified in Section 335243.11 -Fuel System Piping Specialties. Air eliminator connection on the filter vessel shall be ANSI Class 150 flanged connection. Flanged connection of air eliminator shall terminate into the vessel with a socket welded connection. The air eliminator shall be field mounted as detailed with a valve for manual air venting during filling of vessel.
- J. The vessel shall have thermal relief valves as specified in Section 335243.15 Fuel System General Valves. Thermal reliefs shall be set as indicated on the drawings. Thermal relief connection on the filter vessel shall be ANSI Class 150 flanged connection. Flanged connection of thermal relief shall terminate into the vessel with a socket welded connection.
- K. Provide Gammon Technical Products GTP-534-PB-PH-30-S, direct reading differential pressure gauge assembly. The assembly shall be complete with a line pressure gauge, dampeners, valves, and stainless tubing and fittings. The gauge assembly shall be provided with a push button to test the operation of the gauge and a peak hold feature.
- L. Provide Gammon Technical Products GTP-9570-PB flow rate meter for measurement of flow rate with each differential pressure reading. Provide all connecting stainless steel tubing and fittings for connection to the downstream flow control valve and orifice plate.
- M. The Contractor shall provide two extra sets of filter media for each vessel after flushing and turnover.
- N. Provide vessels with a 750W sump heater assembly and a 300W drain line heater assembly. The assemblies for each heater shall include a reset thermostat control with indicating light. The heater assemblies and vessel sump area shall be insulated with cellular glass and protected by an aluminum jacket.

2.02 STATIC RELAXATION VESSEL.

- A. The 200 gallon static relaxation vessels for SRT101, SRT301, and SRT302 (100 gallon vessel for SRT601) shall be of the vertical design and shall be constructed by a manufacturer regularly engaged in the business of construction static relaxation vessels for the aviation industry.
- B. Vessels shall be designed and fabricated of carbon steel in accordance with Section VIII of the ASME Code stamped for 275 psig maximum working pressure with a pressure relief valve set at 125 psig.
- C. All wettable surfaces and components inside the vessel shall be epoxy coated conforming to MIL-C-4556(E) to a dry film thickness of 6 mils.
- D. Piping connections shall be 150-pound ANSI raised-face weld-neck flanges. Inlet and outlet connections shall have 90-degree long-radius welded elbows. Provide 1-inch bottom drain connection.
- E. The vessel shall have a 1-inch air eliminator with stainless steel body and cover, stainless steel float, and Buna-N seat. A stainless steel flange insert check valve shall be installed above the air eliminator. A manual air vent shall be provided on top of the vessel to allow venting of the vessel if a drain down is completed. Provide a flanged site flow indicator on the air eliminator discharge. Discharge air eliminator to the 1" piping as indicated on contract Drawings
- F. Provide a thermal relief and discharge into the 1" piping on the skid, routed as indicated on the contract Drawings.
- G. Provide minimum 6-inch flanged clean-out connections on the top and bottom of the vessel.
- H. Vessel shall be provided with a manual sump drain valve capable of fitting a 5 gal. bucket under valve.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish the services of an experienced service engineer for a minimum of two days on the jobsite to verify proper installation and assist in start-up, check-out and calibration. Allow for two separate trips to the jobsite if required by the construction schedule.

END OF SECTION

SECTION 335243.31

ABOVEGROUND AVIATION FUEL BULK UNLOADING/LOADING SKID SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the design, fabrication, flushing, testing, and delivery of the following factory fabricated skids:
 - 1. (1) 400 gpm bulk Jet-A unload skid.
 - 2. (2) 400 gpm bulk Jet-A load/unload skids.
 - 3. (1) 200 gpm AVGAS load/unload skid
- B. The Jet-A and Avgas load/unload skid assemblies shall have the ability to offload transport trucks and to fill refuelers as well as recirculate fuel from the tank(s), through filtration, and back into the tank(s). The skid shall include two off load connections, strainer, meter, self priming centrifugal pump with automatic air release head, filter separator, static relaxation chamber, loading hose, loading control valve, water slug valve, piping, valves, controls, motor starter, and all miscellaneous equipment and materials required to provide a complete and stand-alone system. The specifications included herein and the associated drawings provide for the basis of design for the pumping skid. It shall be the manufacturer's responsibility to design the actual skid; however, the equipment, valves, pressure gauges, etc. that are indicated shall be used as a minimum standard.
- C. The Jet-A unloading skid assembly shall have the ability to offload transport trucks to the Jet-A tanks. The skid shall include one offload connection, strainer, meter, self priming centrifugal pump with automatic air release head, filter separator, static relaxation chamber, sump separator, water slug valve, piping, valves, controls, motor starter, and all miscellaneous equipment and materials required to provide a complete and stand-alone system. The specifications included herein and the associated drawings provide for the basis of design for the pumping skid. It shall be the manufacturer's responsibility to design the actual skid; however, the equipment, valves, pressure gauges, etc. that are indicated shall be used as a minimum standard.
- D. The bulk unloading/loading pump equipment shall be skid mounted as indicated in the drawings. The drawings are diagrammatic in nature and do not represent the final product. The manufacturer shall be responsible for the design of the skid to ensure there are no interferences with the actual equipment provided and to ensure the proper operation of the system.
- E. The skids shall include all electrical complete, including motor starter, and wired to a control panel on the skid. The panel shall include a local EFSO (emergency fuel shut off) button with signage per NFPA 407. The control panel shall include relays to provide outputs to allow the main fuel system control panel to shut down all other pumps on adjacent tanks. In addition, the skid controls shall accept control inputs to shutdown pump in the event of an EFSO activation elsewhere on the site from other skid(s) or other push stations on the facility.
- F. The Manufacturer shall be responsible for establishing all testing procedures and shall demonstrate operation completed "system" to the Owner and Engineer at the manufacturer's test facility. The skid system shall be fully operational and fully tested at the manufacturer's facility prior to shipment. Testing fluid shall be Jet-A for the Jet-A skids and AVGAS for the AVGAS skid.
- G. System Description
 - 1. The pump skid assembly shall be factory fabricated on a skid and shall be pre-wired with both power and control wiring. All electrical connections, equipment, wiring, and accessories shall comply with Class I, Zone I requirements for hazardous locations.
 - 2. The systems shall be capable of receiving and bulk loading fuel at an actual flow rate of 400 gpm for the 100 and 300 series skids, and 200 gpm for the 600 series skid assuming a differential pressure of 15 psig across the filter separator and flowing into a full tank. For loading operations, the pressure at the truck loading nozzle shall be minimum 35 psig.

3. The units shall be configured for receiving fuel from over-the-road transport trucks and dispensing into bottom loading refueler vehicles.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- D. Section 335243.15 Fuel System General Valves
- E. Section 335243.16 Aviation Fuel Control Valves
- F. Section 335243.21 Fuel System Metering Equipment
- G. Section 335643.15 Fuel System Aboveground Horizontal Tanks

1.03 REFERENCES

- A. Air transport Association (ATA)
 - 1. 103 Standards for Jet Fuel Quality Control at Airports, 2019.
- B. American Society of Mechanical Engineers (ASME)
 - 1. B31.3 Process Piping
- C. American Society for Testing and Materials (ASTM):
 - 1. A53 Pipe, Steel, Black, and Hot Dipped, Zinc Coated Welded and Seamless.
 - 2. A182 Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service.
 - 3. A312/A312M Seamless and Welded Austenitic Stainless Steel Pipe.
 - 4. A403/A403M Wrought Austenitic Stainless Steel Piping Fittings.
 - 5. A193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - 6. A194 Carbon and Alloy Steel Nuts for Bolts for High Temperature Service.
 - 7. D1655 Specification for Aviation Turbine Fuels.
 - 8. D2276 Test Methods for Particulate Contaminants in Aviation Turbine Fuels.
 - 9. D4176 Standard Test Method for Fee Water and Particulate Contamination in Distillate Fuels(Visual Inspection Procedures).
 - 10. D3830 Standard Practice for Filter Membrane Color Ratings for Aviation Turbine Fuels.
- D. American National Standards Institute (ANSI):
 - 1. A13.1 Scheme for the Identification of Piping Systems.
 - 2. B16.9 Factory Made Wrought Steel Butt Welding Fittings.
 - 3. B16.11 Forged Steel Fittings, Socket-Welding and Threaded.
 - 4. B16.25 Butt-welding Ends.
 - 5. B16.5 Pipe Flanges and Flanged Fittings.
- E. American Petroleum Institute (API):
 - 1. 5L Line Pipe
 - 2. 601.21 Metallic Gaskets for Piping, Double-Jacketed Corrugated and Spiral Wound.
 - 3. 1529 Aviation Fueling Hose.
 - 4. 1542 Airport Equipment Marking for Fuel Identification.
 - 5. 1581 Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separator.
- F. United Laboratories Canada (ULC)
- G. Military Specifications:
 - 1. MIL-C-4556 Coating, Kit, Epoxy for Interior of Steel Fuel Tanks.
- H. National Fire Protection Association (NFPA):
 - 1. 30 Flammable and Combustible Liquids Code.
 - 2. 70 National Electrical Code.
 - 3. 407 Aircraft Fuel Servicing.

335243.31 - Aboveground Aviation Fuel Bulk Unloading/Loading Skid

Systems

- I. Steel Structures Painting Council (SSPC):
 - 1. SP-5 White Metal Blast Cleaning.
 - 2. SP-6 Commercial Blast Cleaning.

1.04 SUBMITTALS

- A. Submit as specified in Section 01 33 00 Compliance Submittals.
- B. Submittals shall be made on the assembly at one time and it shall include, at a minimum, all equipment, components, items, materials, coatings, etc. which are used or included in the assembly.
- C. Submittals shall be processed in accordance with this section and the request for quote from the Owner.
- D. The Manufacturer's attention is called to the Owner's and Engineer's review of submittals. This review shall be completed and approved before starting fabrication and before procurement of any material or equipment.
- E. Submittal Formats are as follows:
 - 1. Product Information: Submit manufacturer's data sheets identifying physical size, weight, dimensions, descriptions, specifications, materials, design and performance characteristics, ratings, code conformance, suitability with aviation fuels, etc.
 - 2. Drawings: Submit drawings which graphically show detailed schematic diagrams of the on-skid piping and control systems, details of the assembly fabrication, layouts of equipment, piping and hoses, instruments, orientations, material types, valve numbers, connections, manufacturers of OEM supplied equipment and other relational aspects of the assembly.
 - 3. Instructions: Preprinted material describing installation of a product, system or material, including special notices and material safety data sheet, if any, concerning impedances, hazards and safety precautions.
 - 4. Statements: A document, required of the Contractor or through the Contractor, from a supplier, installer, manufacturer, or other sub-contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications or other verifications of quality.
 - 5. Reports: Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.
 - 6. Certificates: Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of this contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.
 - 7. Records: Documentation to record compliance with technical or administrative requirements.
 - 8. Hydraulic calculations based upon actual piping layout and equipment being provided to ensure the design flow rate.

F. Product Data

- 1. Valves
- 2. Pumps
- 3. Controls
- 4. Sample connections
- 5. Thermal relief valves
- 6. Piping and connections
- 7. Panels
- 8. Hoses
- 9. Couplers

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Fuel Bulk Unloading/Loading Skid

Systems

- 10. Adaptors
- 11. Swivel joints
- 12. Electrical conduit
- 13. Dead man control system
- 14. Emergency fuel shut-off
- 15. Sump Separator
- 16. Filter Separator
- 17. Static Relaxation Vessel
- 18. Coatings
- 19. Meter with register
- 20. Strainer
- 21. Pressure Gauges
- 22. Water Slug/Flow Control Valves Drawings
- G. Shop drawings
 - 1. Overall assembly including all equipment. Supply drawings in at least three views.
 - 2. Flow diagram showing all connections and major components including but not limited to valves and filter.
 - 3. Control diagram
 - a. Control panels
 - b. Deadman control system and operating electrical schematic related to the skid
 - c. Emergency fuel shut-off location, device and wiring schematic
- H. Instructions

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- 1. Overall system maintenance and operation overall system instructions
- 2. Controls Operation and Service technician point of contact
- 3. Instructions to installing contractor
- 4. Commissioning instructions
- Quality Assurance
 - 1. Design Data
 - a. Calculations
 - 1) Hydraulic calculations verifying pump can meet project specifications
 - 2. Test Reports
 - a. Coating Inspection results
 - b. On-skid control testing at factory
 - 3. Manufacturer's Field Reports
 - 4. Qualification Statements
 - 5. Certifications
 - a. Pipe fabrication mill certification
 - b. Filter separator certifications
 - c. Hose certifications.
- J. Closeout Submittals
 - 1. Commisioning Report
 - 2. Warranty

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. All equipment and material shall be the latest design, new, and the highest quality standard product of manufacturers regularly engaged in the production of such equipment and material for a minimum of 5 years. The manufacturer shall have assemblies that have been in satisfactory use in similar service for not less than 5 years.
 - 2. When two or more units of the same class of equipment are required, they shall be the products of a single manufacturer.

- 3. Coating applicator shall have a minimum of 5 years of experience in the application of the type of coating system used.
- B. All items, material, components, coatings, and equipment shall be compatible for use with the fuel stored. The Jet-A assembly shall be suitable for use with Jet-A turbine fuel per ASTM D1655 with a maximum operation pressure of 275 psig, within a temperature range of 0°F to 130°F, and having a specific gravity of 0.81 ± 0.05. The Avgas assembly shall be suitable for use with 100LL Avgas per ASTM D910 with a maximum operating pressure of 275 psig, with a temperature range of 0°F to 130°F, and having a specific gravity of 0.81 ± 0.05. The Avgas assembly shall be suitable for use with 100LL Avgas per ASTM D910 with a maximum operating pressure of 275 psig, with a temperature range of 0°F to 130°F, and having a specific gravity of 0.65.
- C. All items shall be American made, manufactured in the Untied States of America.
- D. A certification of quality control procedures utilized, and results thereof, during application of both internal and external coatings shall be submitted. Certification shall include surface preparation, film thickness per coat, curing procedures, and holiday testing.
- E. The skids shall be built in strict accordance with the NFPA 30, NFPA 70, and NFPA 407.
- F. Qualify welding processes and welding operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX. Submit qualification reports in the format as suggested in Appendix B of Section IX.
- G. Galvanized metals, zinc, copper, copper alloys or cadmium components are not permitted for products coming into direct contact with Aviation Fuels. No aluminum components are permitted.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, products specified herein are to be furnished for each skid assembly at the factory.
- B. Equipment such as filters, pumps, meters, air eliminators, and hose connections shall be designed to be easily maintainable by providing isolation valves between all pieces of equipment.
- C. For each skid-mounted assembly, submit drawings, include both detailed piping drawings and flow diagrams.
- D. Piping, valves and equipment shall be protected with thermal pressure relief valves with discharge piping from each thermal relief valve routed back as indicated on the drawings. Provide sight flow indicators on the discharge of each relief valve. Provide isolation ball valves on either side of PRV/site flow indicators for maintenance.
- E. Piping and equipment shall be designed to provide tank recirculation capability. Piping shall also be designed to allow the off-loading of refuelers using the refueler to pump into the tank without going through the pump but flowing through the filter.

2.02 HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMP

A. See Section 335243.23 - Fuel System Pumps

2.03 FILTER SEPARATOR

A. See Section 335243.28 - Fuel System Filtration

2.04 SUMP SEPARATOR

A. See Section 335243.11 - Fuel System Piping Specialties

2.05 STATIC RELAXATION VESSEL.

A. See Section 335243.28 - Fuel System Filtration

2.06 JET-A LOADING METER:

A. See Section 335243.21 - Fuel System Metering Equipment

2.07 STRAINER

A. See Section 335243.11 - Fuel System Piping Specialties

2.08 FUEL SAMPLING CONNECTIONS:

A. See Section 335243.24 - Fuel System Inspection, Testing, and Flushing.

2.09 SIGHT FLOW INDICATORS:

A. See Section 335243.11 - Fuel System Piping Specialties

2.10 HOSE SWIVEL JOINT:

A. See Section 335243.11 - Fuel System Piping Specialties

2.11 LOADING HOSE:

A. See Section 335243.11 - Fuel System Piping Specialties

2.12 JET-A LOADING HOSE NOZZLE:

A. See Section 335243.11 - Fuel System Piping Specialties

2.13 INSTRUMENT TUBING AND FITTINGS:

A. See Section 335243.24 - Fuel System Inspection, Testing, and Flushing

2.14 PRESSURE GAUGES AND ACCESSORIES:

A. See Section 335243.24 - Fuel System Inspection, Testing, and Flushing

2.15 BALL VALVES:

A. See Section 335243.15 - Fuel System General Valves

2.16 BUTTERFLY VALVES:

A. See Section 335243.15 - Fuel System General Valves

2.17 WAFER STYLE CHECK VALVES:

A. See Section 335243.15 - Fuel System General Valves

2.18 FLANGED INSERT CHECK VALVES

A. See Section 335243.15 - Fuel System General Valves.

2.19 PRESSURE/THERMAL RELIEF VALVES:

A. See Section 335243.15 - Fuel System General Valves.

2.20 DIAPHRAGM OPERATED CONTROL VALVES:

- A. See Section 335243.16 Aviation Fuel Control Valves
- B. Bonding Cable Reel
 - 1. See Section 335243.11 Fuel System Piping Specialties

2.21 CONTROLS

- A. Provide products suitable in the application intended that is, a fuel system for combustible and flammable fluids in a critical application where failure of the control system could seriously compromise the use of the fuel system or cause bodily harm.
- B. Control Panels:
 - 1. Enclosure: The enclosure shall be rated and listed for the hazardous environment in which it is installed. Panel enclosures shall be NEMA 7 explosion proof.
 - 2. Wiring:
 - a. Provide all wiring necessary for equipment specified for installation, including internal wiring for all spare equipment and all future connections as required.
 - b. NEC type THHN/THWN wire, rated 90 degrees C at 600 volts with cable glands suitable for a Class I, Zone 1 hazardous area.

- c. Wire shall be sized for the load being serviced, No. 14 AWG minimum for controls, No. 12 AWG minimum for power unless otherwise indicated.
- d. Wiring shall be color-coded.
- 3. Wire Markers:
 - a. Hot stamped type, Brady Ty-grip, Electrovert slip on Type Z, or Floy Tag FT200C wire markers sized for snug fit for wire size.
 - b. Identify both ends of wire with the same unique wire number.
 - c. Wire numbers shall be assigned where specific designations are not indicated.
- 4. Grounding:
 - a. Site grounding and bonding system shall consist of an underground 4/0 CU stranded cable, exothermically connected to 10' x ¾" copper clad ground rods. Skid shall be bonded to grounding system as indicated in the contract drawings.
- 5. Emergency Fuel Shutoff System/Tank Level Permissives:
 - a. Tank Level High-High: Pump shall shutoff via an adjustable timer that is activated when the water slug valve position switch is in the closed position.
 - b. Provide contacts from the EFSO relay located on the electrical rack as a permissive to run the pump on the skid. The EFSO relay will terminate the permissive if any EFSO button is pressed. When the skid loses the permissive, the skid shall stop the pump operation and illuminate an alarm light.
- C. Flow Computer and Loading Control System:
 - 1. Ground verification and overfill prevention units
 - a. The truck loading overfill protection and ground verification system shall be a microprocessor based system in an explosion proof enclosure. The system shall provide for overfill protection of a single compartment refueler vehicle. The system shall signal the flow computer via dry contact a "no flow permissive" to close the digital control loading control valve in the event of an overfill or fault detection. A 30-foot coiled cable and API 2-wire Optic/Thermistor Standard interface shall be provided. The system shall provide for vehicle ground verification with a self-checking feature. This shall prevent and also shut down the loading operation if a proper bond for static discharge is not detected. Console shall be Scully Intellitrol Model IC-OG with security bypass authorizer and deadman switch, or approved equal. Provide one system for each skid.
 - b. Provide cable storage hangers for both the overfill probe and the grounding probe (if separate).
 - c. Auxiliary Testing Equipment:
 - 1) Contractor shall prove a Universal Loading Rack Tester as manufactured by Scully. One required.
 - d. Hardwire True Bypass
 - Provide true-bypass of the Scully system via a local rack mounted control station. Provide a Nema 4,7, weatherproof, factory sealed, 2 position, maintained contact selector switch with "normal-byass" nameplate. Provide nameplate above switch which reads "Scully Bypass." Contacts shall be rated 5A at 120 Vac. Provide one bypass switch per Scully unit.
 - 2. Flow computer
 - a. Provide flow computer as indicated on the drawings for flow control of loading flow control valve on the skid and for user interface with control system. Flow computer shall consist of a controller and a keypad. Flow computer shall have memory sufficient to store database of up to 100 users and with individual PIN numbers.
 - b. The combination controller and keypad shall be as manufactured by Smith (Microload), Brooks (Petrocount) or approved equal. Any necessary interface software, drivers and hardware shall be provided by the contractor, at no addition cost to the contract.
 - c. Provide the unit with all integral power supplies necessary to convert 120Vac to voltage required by the unit's electronics.

- d. Provide each flow computer with a NEMA 4/Nema 7 enclosure suitable for an outdoor exposed location.
- e. Flow computer shall be rated for exterior use and shall operate in ambient conditions from -10 to 60 degrees Celsius.
- 3. Electrical Deadman Switch:
 - a. Provide an electric deadman system with a machined aluminum control handle and 20 ft. coiled cord. Entire system shall be intrinsically safe with 120V AC relay located in an explosion proof enclosure. Mount each deadman on an individual support rack structure with a stowage means for the handle/cable assembly.
 - b. Release of deadman shall close the loading control valve through the 120V solenoid on the control valve. The pump shall continue to operate.
 - c. Deadman shall be wired up to the flow computer and shall provide a permissive for the enable/disable of a flow control valve by making/breaking 120 Vac to the solenoid. Provide all interconnecting cable, conduit and fittings between deadman and electric solenoid.
- D. Water slug valve system:
 - 1. The filter separator shall be equipped with the water detection probe as specified. Activation of the switch shall close the 120V solenoid on the water slug valve. This shall allow water detection and shutdown for either the pump operation or the offloading of a refueler.
- E. Pump Operation shall be by a hand operated, keyed, hand/off/auto switch. When switch is in "Hand" all loading devies such as the flow computer and the overfill prevention/ground verification unit shall be bypassed. The EFSO integration shall remain active. Provide safeties as specified for pump. Pump shall shutoff via an adjustable timer that is activated when the water slug valve position switch is in the closed position. After 30 seconds of no flow, the pump shall shut off and indicate a red light for pump fail. Provide a custom control panel to include the following:
 - 1. Red light for water detection in filter separator
 - 2. Green light for pump running
 - 3. Red light for pump fail
 - 4. Red light for EFSO activation

2.22 FIRE EXTINGUISHER

A. Provide a 80# B:C fire extinguisher on the bulk skids. Provide attachment bracket on skid column and provide signage with 2" high red letters.

2.23 PIPING

A. See Section 335243.13 - Aviation Fuel Pipe, Fittings, and Installation.

PART 3 - EXECUTION

3.01 DELIVERY AND HANDLING

- A. Completed and tested skids shall be delivered to project site.
- B. Protect internal and external parts against rust and corrosion.
- C. Pack items with factory applied end caps or seals.
- D. Protect internal components against damage from rattling, shifting and moving.

3.02 WARRANTY

A. The overall assembly and appurtenances shall be new and the overall assembly shall have a one-year warranty by the Manufacturer after system installation and training has taken place. If defects arise, the supplier/manufacturer shall replace or repair the equipment at the Owner's discretion at no cost to the Owner. The coating shall be warranted for a period of 5 years against rusting, pitting, and adhesion problems. Repairs to the coatings shall be completed by the manufacturer under the warranty period.

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3.03 OPERATOR'S INSTRUCTIONS BY MANUFACTURER

- A. Before final inspection, instruct Operator's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
- B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Provide instructions and demonstrations to designated operating personnel covering operation, adjustment and maintenance of mechanical work. Operating personnel shall be instructed to gain a thorough knowledge and understanding of associated mechanical work. Instructions and demonstrations to include performance requirements, manufacturer's instructions and all phases of safe operation, control, adjustment and maintenance.
- D. Furnish product manufacturer's factory trained representative to provide instructions and demonstrations after product is installed and ready for operation.
- E. Operation and Maintenance Manuals:
 - 1. At the project's completion, the Manufacturer shall submit a complete system Operating and Maintenance Manual (O&M). The manual at a minimum shall include the following:
 - a. The manual shall be composed of typed instruction sheets with large drawing sheets (not reduced) folded in with reinforced margin. It shall have a post binder system so that sheets can be easily substituted and shall have a hard cover.
 - b. The manual shall be organized into systems and shall contain the manufacturer's complete detailed operating and maintenance instructions with data sheets for each piece of equipment furnished under this project.
 - c. Include a spare parts list for each major piece of equipment furnished for the project including but not limited to: control valves, controls, and accessories.
 - d. Provide a comprehensive list of maintenance procedures for preventative maintenance and troubleshooting; repair and reassembly, aligning and adjusting, and disassembly.
 - e. Format:
 - 1) Binders: Commercial quality, 8 ¹/₂" x 11 inch binders with hardback, cleanable covers.
 - Cover: Identify each binder with typed or printed title "Operation and Maintenance Instructions;" list title of project; identify subject matter of contents; identify volume number if multiple binders are required.
 - 3) Arrange content by systems under paragraph numbers of this specification section.
 - 4) Provide heavy tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
 - 5) Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
 - 6) Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
 - f. Contents, each volume:
 - 1) Table of Contents: Provide title of Project; names, addresses and telephone numbers of manufacturer with name of responsible parties; schedule of products and systems, indexed to content of the volume.
 - 2) For Each Product or System: List names, addresses and telephone numbers of subcontractors and Manufacturers, including local source of supplies and replacement parts.
 - 3) Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - 4) Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project As-Built-Record Documents as maintenance drawings.

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- 5) Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- 6) Warranties and Bonds: Bind in copy of each.
- g. Manual for Equipment and Systems:
 - 1) Each item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - 2) Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
 - 3) Include as-installed color-coded wiring diagrams.
 - 4) Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - 5) Maintenance Requirements: Include routine procedures and guide for troubleshooting; disassembly, repair, re-assembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - 6) Provide servicing and lubrication schedules, and lists of lubricants required.
 - 7) Include manufacturer's printed operation and maintenance instructions.
 - 8) Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - 9) Provide as-installed control diagrams by controls manufacturer.
 - 10) Provide Contractor's coordination drawings, with as-installed color-coded piping diagrams.
 - 11) Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - 12) Include test and start-up reports.
 - 13) Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
- h. Instruction of Operator:
 - 1) Before final inspection, instruct Operator's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
 - 2) Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
 - 3) Prepare and insert additional data in Operations and Maintenance Manual when need for such data becomes apparent during instruction.
- i. Submittals:
 - Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. The Engineer will review draft and return one (1) copy with comments.
 - 2) Submit four (4) copies of revised volumes of data in final form within ten (10) days after commissioning.

3.04 FABRICATION FACILITY INSPECTIONS

A. Manufacturer shall establish an inspection visit schedule with dates at key points in the fabrication of the skid systems. Provide schedule of dates to the Engineer three weeks prior to first inspections.

3.05 INSTALLATION

A. The skids shall be tested and commissioned by a manufacturer's trained representative. Provide turnover assistance, system startup and testing, and instruction to the Operator amounting to a minimum of two days on the site on two separate occasions due to the phasing

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Fuel Bulk Unloading/Loading Skid

Systems

of the construction.

- B. Coordinate delivery and installation with Owner
- C. Temporarily place skid as indicated on drawings. Skid shall be anchored at a later date. After being moved to its permanent location, anchor skid(s) at all four corners. Elevate as details to allow surface drainage to flow under skid. Level skid and tighten all bolts. Grout under anchor plates. After anchoring of skid, install arched metal canopy system per the manufacturer's recommended installation instructions.
- D. Contractor shall field repair all coating damage during delivery and installation. Coating system shall be identical to the system used for the original coating.

3.06 TESTING, FLUSHING, AND STARTUP

- A. General
 - 1. The manufacturer shall BE RESPONSIBLE FOR THE OPERATION OF ALL PERMANENT AND TEMPORARY EQUIPMENT AND SYSTEMS AND CONDUCT ALL PERFORMACE TESTS IN A SAFE AND EFFECTIVE MANNER. The Manufacturer shall provide all the necessary equipment, tolls, media and labor required for the proper performance of the tests.
 - 2. Water shall not be used for the testing and flushing of any fuel piping or components.
 - 3. The Manufacturer shall be responsible for establishing all testing procedures and shall demonstrate operation completed "system" to the Owner and Engineer at the manufacturer's test facility. The skid system shall be fully operational and fully tested at the manufacturer's facility prior to shipment.
 - 4. All piping shall be drained at the factory prior to shipment and all open flanged connections shall be covered for shipment.
 - 5. Manufacturer shall be present and conduct start-up and testing procedures at the site after construction of the fuel facility is complete.
 - a. The Owner will provide fuel for field flushing and start-up. The Manufacturer shall observe diligent care not to waste, spill or contaminate the fuel. The cost of all fuel spilled, wasted or contaminated shall be paid for by the Manufacturer at the Owner's purchase rate times a 1.20 multiplier. The Manufacturer shall also be responsible for any and all required clean up and soil remediation caused by their spill at no additional cost.
- B. System Testing:
 - 1. After all individual devices and components have been tested and after the piping system has been tested and flushed, the Manufacturer shall perform overall operational system tests. It shall be the responsibility of the Manufacturer to debug, test and verify operation of the installed systems in complete conformance to itemized functions of each component. Test requirements to include but not limited to the following:
 - a. Tests shall include checks to determine that all control valves and switches are properly adjusted.
 - b. Testing shall include the functions of the complete electrical system including the emergency shut-off electrical system.
 - c. Testing of the flow computer.
 - d. All instruments required to conduct the tests shall be furnished and operated by the Manufacturer using experienced and qualified personnel.
 - e. All test will be witnessed by representatives of the Engineer.
 - f. The Manufacturer shall notify the Engineer at least 7 days in advance of the approximate proposed date of test followed by a not less than 48 hours advance notice.

3.07 TRAINING

A. The manufacturer shall conduct two (2) four-hour training classes for Airport's personnel to include operation procedures, maintenance, adjustment and diagnostics.

END OF SECTION

SECTION 335643.15 FUEL SYSTEM ABOVEGROUND HORIZONTAL TANKS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This section includes the fabrication, and delivery of (3) 40,000-gallon aboveground horizontal double wall (containment style) cylindrical fuel tanks for Jet-A service, (1) 12,000-gallon aboveground horizontal double wall (containment style) cylindrical fuel tank for AVGAS service, and (1) 1,000-gallon aboveground split-service double wall (containment style) fuel tank for Diesel and Mogas service. These tanks shall be constructed in accordance with UL-2085 and so labeled. This section also includes the fabrication, and delivery of (1) 500-gallon aboveground horizontal single wall cylindrical waste tank. This tank shall be constructed in accordance with UL-142 and so labeled.
- B. Please refer to specification 335643.17 for details regarding the 1,000-gallon aboveground split-service double wall (containment style) fuel tank for Diesel and Mogas service. Tank shall be designed and manufactured by Convault or approved equal.
- C. The tank(s) and components shall be suitable for use with the product stored in them.
- D. Tank shall be equipped with specified appurtenances and all specified equipment. The arrangement of nozzles and appurtenances is shown on the drawings.
- E. The Tanks shall have a platform with a ladder, or stairs as indicated.
- F. The Manufacturer shall not supply, furnish, or install any pipe flanges, fittings, bolts or nuts of foreign manufacturer. All pipe flanges, fittings, bolts and nuts shall be manufactured in the United States of America, and the Manufacturer warrants the U.S.A. origin of all such items. The Manufacturer shall provide written certification from the manufacturer as to the origin of all flanges, fittings, bolts, and nuts installed on the project.

1.02 RELATED SECTIONS

- A. Section 099713.00 Fuel System Coatings
- B. Section 335243.00 Fuel System General Provisions
- C. Section 335243.11 Fuel System Piping Specialties
- D. Section 335243.13 Aviation Fuel Pipe, Fittings, and Installation
- E. Section 335243.15 Fuel System General Valves
- F. Section 335243.16 Aviation Fuel Control Valves
- G. Section 335243.28 Fuel System Filtration

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. B1.20.1 General Purpose Pipe Threads
- B. National Electrical Manufacturers Association (NEMA)
- C. Military Specifications:
 - 1. MIL-C-4556 Coating Kit, Epoxy, for Interior of Steel Fuel Tanks.
- D. Underwriters' Laboratories (UL):
 - 1. 142 Steel Aboveground Tanks for Flammable and Combustible Liquids
 - 2. 2085 Protected Aboveground Tanks for Flammable and Combustible Liquids
- E. National Fire Protection Association (NFPA)
 - 1. NFPA 30, Flammable and Combustible Liquids Code
 - 2. NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages
- F. International Fire Code
- G. OSHA 29CRF1910 Occupational Safety and Health Standards
- H. API 2000 Venting Atmospheric and Low-Pressure Storage Tanks

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335643.15 - Fuel System
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Aboveground Horizontal Tanks

1.04 SUBMITTALS

- A. Submit as specified in Section 335243.00 Fuel System General Provisions.
- B. Product Data
 - 1. Tank Interstitial Monitor
 - 2. Pressure Vacuum Vent
 - 3. Secondary Emergency Vent
 - 4. Normal Vent
 - 5. Primary Emergency Vent
 - 6. Tank Gauging and High Level Alarm
 - 7. Level Transmitter with stilling well
 - 8. Overfill Prevention Valve
 - 9. Floating Suction Position Indicator
 - 10. Manual Gauge Hatch
 - 11. Manual Stick Gauge
 - 12. Fill Diffuser
- C. Shop Drawings
 - 1. Complete Tank Layout Drawing Including Material Thickness
 - 2. Proposed Labeling
 - 3. Nameplate Data
 - 4. Complete details of tank, saddle supports, and piping, including critical dimensions and locations of all fittings, equipment, man-ways, stairs, platforms, accessories, and tank anchor locations.
- D. Quality Assurance
 - 1. Design Data
 - a. Calculations
 - 1) Tank Strapping Table
 - 2. Test Reports
 - a. UL-142 Tests
 - b. UL-2085 Tests
 - 3. Qualification Statements
 - a. 5 Years Experience in the Manufacturing of Above Ground Horizontal Tanks.
 - b. 5 Years Experience in the Application of Coating System.
 - c. Welding Procedures and Qualifications
 - 4. Certifications
 - a. U.S.A Origin for all Materials.
 - b. UL-142
 - c. UL-2085
- E. Closeout Submittals
 - 1. Tank Warranty.
 - 2. Equipment Warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: All equipment and material shall be the latest design, new, and the highest quality standard product of manufacturers regularly engaged in the production of such equipment and material for a minimum of 5 years. The manufacturer shall have assemblies that have been in satisfactory use in similar service for not less than 5 years.
- B. Qualify welding processes and welding operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX. Submit qualification reports in the format as suggested in Appendix B of Section IX.
- C. When two or more units of the same class of equipment are required, they shall be the products of a single manufacturer.

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- D. Coating applicator shall have a minimum of 5 years of experience in the application of the type of coating system used.
- E. Performance Characteristics: Tank shall be built in strict accordance with NFPA 30, UL 142, UL-2085 and shall be inspected and labeled by Underwriters Laboratories, Inc.
- F. All steel shall be new and shall not have been used previously for any other purpose and shall be of U.S. origin.

PART 2 - MATERIALS

2.01 DOUBLE WALL HORIZONTAL CYLINDRICAL TANK

- A. Tank shall be as manufactured by a facility licensed by the Steel Tank Institute and be experienced in the construction of UL-2085 horizontal steel tanks.
- B. The tank shall be horizontal, cylindrical, and shall be of a double wall steel construction conforming to UL-2085 and so labeled. The secondary tank shall be a complete 360 degree wrap.
- C. The Jet-A primary tank shall have a nominal capacity of 40,000 U.S. gallons and the overall tank exterior shall be nominally 12'-0" dia. X 52'-1" in length. The AVGAS primary tank shall have a nominal capacity of 12,000 U.S. gallons and the overall tank exterior shall be nominally 8'-6" dia. X 32'-7" in length.
- D. The tank shall be supported by two saddles on each tank. Saddles shall be designed to UL 142 requirements and shall be welded to the tank. Saddles shall provide 4-inch clearance between bottom of tank and bottom of saddle. Saddles shall be designed to meet the Uniform Building Code.
- E. The tank shall be internally coated and externally painted in accordance with Section 099713.00 Fuel System Coatings. All internal tank surfaces in contact with fuel including piping, stairs, etc., shall be coated.
- F. The tank shall have a tank-strapping table developed by the contractor after the tank is fabricated. Strapping chart shall take the 2.5% slope into account as the tank will set when installed and shall be based on readings at the nozzle connection for the electronic level gauge.
- G. Shell and head joints shall be butt joints with full penetration welds. Welds located on the interior of the tank shall be ground smooth removing all weld splatter to accommodate the internal coating of the tank. The interior welds along the bottom 6-inches of the tank shall be ground flush prior to coating to allow any water in the fuel tank to migrate to the sump location to allow for removal. Joint details shall be shown on the manufacturer drawings.
- H. All piping shall include pipe, fittings, valves, supports, and shall be of carbon steel construction and in conformance with the materials specified in this specification.
- I. The tank shall be installed off level by setting the tank supports flush on the sloped concrete pad. This will provide a 2.5% slope of the tank draining to the low end with the water draw off connection.

2.02 SINGLE WALL HORIZONTAL CYLINDRICAL TANK

- A. Tank shall be as manufactured by a facility licensed by the Steel Tank Institute and be experienced in the construction of UL-142 horizontal steel tanks.
- B. The tank shall be horizontal, cylindrical, and shall be of a single wall steel construction conforming to UL-142 and so labeled.
- C. The waste fuel tank shall have a nominal capacity of 500 U.S. gallons and the overall tank exterior shall be nominally 4'-0" dia. X 5'-5" in length.
- D. The tank shall be supported by two saddles on each tank. Saddles shall be designed to UL 142 requirements and shall be welded to the tank. Saddles shall provide 4-inch clearance between bottom of tank and bottom of saddle. Saddles shall be designed to meet the Uniform Building Code.

- E. The tank shall be internally coated and externally painted in accordance with Section 099713.00 Fuel System Coatings. All internal tank surfaces in contact with fuel including piping, stairs, etc., shall be coated.
- F. The tank shall have a tank-strapping table developed by the contractor after the tank is fabricated. Strapping chart shall take the 2.5% slope into account as the tank will set when installed and shall be based on readings at the nozzle connection for the manual stick gauge.
- G. Shell and head joints shall be butt joints with full penetration welds. Welds located on the interior of the tank shall be ground smooth removing all weld splatter to accommodate the internal coating of the tank. The interior welds along the bottom 6-inches of the tank shall be ground flush prior to coating to allow any water in the fuel tank to migrate to the sump location to allow for removal. Joint details shall be shown on the manufacturer drawings.
- H. All piping shall include pipe, fittings, valves, supports, and shall be of carbon steel construction and in conformance with the materials specified in this specification.

2.03 APPURTENANCES

- A. All appurtenances shall be at the locations indicated on the drawings.
- B. Tank fill drop tubes to extend to the tank bottom and be provided with a diffuser as indicated on the drawings.
- C. Two 30-inch manways on the Avgas tank, two 36-inch manways on the Jet-A tanks, with bolted cover shall be provided at the top of the tank for internal access. The manway shall be equipped with a 3" NPT manual gauging hatch as indicated.
- D. Water draw-off connection shall be located on the top of the tank as indicated on the drawings.

2.04 LADDERS AND PLATFORMS

- A. A platform shall be factory fabricated to provide access to the manway and Avgas tank nozzles. Set of access stairs shall be provided as indicated in the drawings. The access stairs and platform shall be OSHA approved with required toe plate and railings. The grating shall be galvanized steel non-slip, serrated grating, with additional supports provided where grating is cut to fit around manways and nozzles. Platform and stairs shall be bolted to the tanks once they are set in their final location. Platform and stairs shall be secured, true, and level. Any platform/stair attachment hardware which requires welding to the tank shall be installed prior to coating the tank.
- B. A platform assembly, as shown on the drawings, shall be factory fabricated to provide access to the tank manways and tank nozzles. Provide a platform for each tank as shown as well as walkways between the tanks. Provide a set of stairs as shown to allow access to the platform. Stairs shall have an 8" rise and a 9" run and shall be fabricated with a galvanized steel non-slip, serrated grating, and landings as required. Provide a stair on the opposite end of the platform as indicated. The stairs, access ladders and platform shall be OSHA approved with required toe plate and railings. The grating shall be galvanized steel with additional supports and banding of the grating provided where grating is cut to fit around manways and nozzles. Handrails, ladders and structural steel shall be painted safety yellow. Safety chains shall be provided at the ladder access points. Platform and stairs shall be bolted to the tanks once they are set in their final location. Platform and stairs shall be secured, true, and level. Any platform/stair attachment hardware which requires welding to the tank shall be installed prior to coating the tank.
 - 1. Exterior ladders shall comply with the construction requirements in accordance with the current edition of Occupational Safety and Health Standards, Title 29 of the Code of Federal Regulations, Part 1910, Subpart D, Section 1910.27 Fixed Ladders.
 - 2. Guardrails shall comply with Sub-paragraph 1910-23(d)(1) of the current edition of Occupational Safety and Health Standards, Title 29 of the Code of Federal Regulations.
 - Runways (catwalks) shall comply with the construction requirements in accordance with the current edition of Occupational Safety and Health Standards, Title 29 of the Code of Federal Regulations, Part 1910, Subpart D, Section 1910.23 - Guarding Floor and Wall Openings and Holes, sub-paragraph (c) – Protection of open-sided floors, platforms, and runways.

2.05 EQUIPMENT

- A. All equipment shall be provided with the tanks and shall be new and have a one year warranty by the tank manufacturer or the supplier. If defects arise, the manufacturer shall replace or repair the equipment at the Owner's discretion at no cost to the Owner
- B. Normal Vent (40,000-gallon Jet-A Tank)
 - 1. Normal vent cap shall mate to 4" NPT connection. Materials of construction shall be anodized aluminum with a brass screen and Buna-N body seal. Vent shall be sized for a minimum 11,360 SCFH inbreathing and 4,303 SCFH outbreathing with a maximum fill rate of 400 gpm and a maximum withdrawal rate of 400 gpm.
- C. Primary and Secocondary Emergency Vent (40,000-gallon Jet-A Primary and Secondary Tanks)
 - 1. Emergency vent shall be an automatically resetting 10" NPT connection, cast iron painted cover, viton o-ring seat, iron body, with 16 oz. pressure setting or approved equal. Vent shall be sized for a minimum 757,067 SCFH.
- D. Pressure Vacuum Vent (12,000-gallon AVGAS Tank)
 - 1. Normal vent cap shall be a pressure/vacuum vent and shall mate to 3" NPT connection. Materials of construction shall be anodized aluminum with a brass screen and Buna-N body seal. Vent shall be sized for a minimum 5,119 SCFH inbreathing and 6,787 SCFH outbreathing with a maximum fill rate of 400 gpm and a maximum withdrawal rate of 200 gpm. The pressure and vacuum settings shall both be 8 oz/sq in.
- E. Primary and Secondary Emergency Vent (12,000-gallon AVGAS Primary and Secondary Tanks)
 - 1. Emergency vent shall be an automatically resetting 10" NPT connection, cast iron painted cover, viton o-ring seat, iron body, with 16 oz. pressure setting or approved equal. Vent shall be sized for a minimum 445,109 SCFH.
- F. Manual Gauge Hatch
 - 1. The stick gauging hatch shall be a cam and groove side seal adapter with locking cap.
- G. Manual Stick Gauge
 - 1. Provide a wooden stick gauge 12' in length for the Avgas tank, 16' for the Jet-A tanks, with units of measure in inches and minimum resolution of 1/8" for the tanks. Provide a 1 ½" dia. PVC pipe, 12' in length mounted to the platform railing at the tank to house the gauge stick.
- H. Suction Connection for Skid Mounted Pumps
 - 1. For the Jet-A tanks, suction nozzle connection shall be a 6" ANSI Class 150 flange located on the side of a manway per the contract drawings. The nozzle is located such that the offset from the center of the tank on the manway allows the floating suction piping to be along the centerline of the tank.
 - 2. A drop tube and flanged swivel joint shall be mounted in the tank. See Section 33 52 43.11 for floating suction requirements.
- I. Suction Connection for Skid Mounted Pumps
 - 1. For the Avgas tank, suction nozzle connection shall be a 4" ANSI Class 150 flange located on the side of a manway per the contract drawings. The nozzle is located such that the offset from the center of the tank on the manway allows the floating suction piping to be along the centerline of the tank.
 - 2. A drop tube and flanged swivel joint shall be mounted in the tank. See Section 33 52 43.11 for floating suction requirements.
- J. Tank Gauging and High Level Alarm
 - 1. Provide a automatic tank level gauge connected to tank gauging console. Gauge face plate shall be selected based upon the tank dimensions. Provide Pneumercator MP450S Level Gauging Probe. Gauge shall mount in a 2" FNPT tank connection.
 - 2. Provide high level alarm connected to tank gauging console. High level alarms shall be placed near all loading and unloading positions.

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- K. Tank Interstitial Monitor
 - 1. The interstitial space of the double wall tank shall be a float type electronic sensor. The presence of liquid in the interstitial space shall cause the float to rise and provide an audible and visual alarm. The gauge shall mount in a 2" FNPT tank connection.
 - 2. See Seciton 40 70 00.00 Fuel System Instrumentation
- L. Floating Suction Position Indicator
 - 1. The internal floating suction assembly shall have a clock gauge to provide a means to display movement of the floating suction arm as the liquid level rises. The clock gauge shall be mounted in a 2" FNPT fitting located above the floating suction assembly. This will allow the operator to visually inspect the floating suction movement. Clock gauge assembly shall be Morrison Brothers Fig. 818I or approved equal.
- M. Normal Vent (500-gallon Waste Tank)
 - 1. Normal vent cap shall mate to 2" NPT connection. Materials of construction shall be anodized aluminum with a brass screen and Buna-N body seal. Vent shall be sized for a minimum 1,988 SCFH inbreathing and 1,626 SCFH outbreathing with a maximum fill rate of 200 gpm and a maximum withdrawal rate of 200 gpm.
- N. Emergency Vent (500-gallon Waste Tank)
 - 1. Emergency vent shall be an automatically resetting 4" NPT connection, cast iron painted cover, viton o-ring seat, iron body, with 16 oz. pressure setting or approved equal. Vent shall be sized for a minimum [91,745] SCFH.
- O. Spill Container (Waste Tank)
 - 1. Provide 3.5-Gallon Spill container to be installed over fill nozzle on waste tank. Provide Morrison Brothers 517 Series or approved equal.

2.06 FINISHES

A. Coatings and finishes shall be per Specification Section 099713.00 - Fuel System Coatings.

2.07 NAMEPLATE

- A. Certification Label: Each tank shall bear a permanently affixed certification label using bolts, rivets, or self tapping screws. No double sided sticky tape will be allowed. Nameplate shall be stainless steel stamped with the following:
 - 1. Underwriters Laboratory label
 - 2. Name of manufacturer
 - 3. A unique identification number
 - 4. Dimensions, design and working capacity and model number of the tank
 - 5. Year of manufacture
- B. Tank supplier shall not provide additional labeling of the tank advertising the manufacturer, steel construction, and the UL-142 rating. The dataplate shall suffice for identification of the tank fabrication. Only the items required by code and that are required in these specifications shall be included. Provide drawings depicting the proposed labeling.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Provide and pay all freight, express, trucking, transportation, cartage and handling for equipment and materials. Pay for extra handling and shipping expenses incurred in expediting material, etc., to prevent interruption of the overall job progress.
- B. Protect internal and external parts against rust and corrosion and contamination.
- C. Pack items with factory applied covers, caps or blinds on all flanges and connections.
- D. Protect internal components against damage from rattling, shifting and moving.
- E. Spot paint all equipment where the shop paint has been damaged or flaked off in accordance with the coating manufacturer's recommendations.
- F. Pay all demurrage charges resulting from the unloading operation.

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3.02 WARRANTY

- A. The manufacturer's 20-year warranty of the storage tank shall be submitted before delivery.
- B. All equipment shall be new and have a one-year warranty by the tank manufacturer or the supplier after system installation and factory training has taken place. If defects arise, the manufacturer shall replace or repair the equipment at the Owner's discretion at no cost to the Owner. The coating shall be warranted for a period of 5 years against rusting, pitting, and adhesion problems.

3.03 FABRICATION FACILITY INSPECTIONS

A. Manufacturer shall establish an inspection visit schedule with dates at key points in the fabrication of the tank systems. Provide schedule of dates to the Owner and Engineer four weeks prior to first inspections.

3.04 TESTING

- A. Perform all shop performance tests required by UL-142 and UL-2085 respectively, including, but not limited to, tank leakage and hydrostatic strength tests. Test both the primary and secondary containment tanks. Provide all test results.
- B. If double wall tanks are shipped prior to filling the interstitial space, the double wall tank(s) shall be shipped with the interstitial space under pneumatic test. Provide pressure gauge assembly to allow the receiving agent/Engineer to verify the interstitial space is holding pressure after delivery.
- C. Perform all coating inspections as specified in Section 099713.00 Fuel System Coatings.

3.05 INSTALLATION:

- A. The tank manufacturer shall provide the tank vents as specified and shall install all equipment either at the factory or on site at the time of delivery. Prior to installation, pavement joints shall be sawcut and joint sealant installed.
- B. The tanks are designed to rest on a slope concrete pad as shown.
- C. It shall be the Contractor's responsibility or his designee to offload and set the tanks and install the platforms. Provide any manufacturer instructions required to perform proper installation.
- D. The Contractor shall field repair any damage to coatings as a result of delivery and installation. Coating system shall be identical to the system used by the tank manufacturer.
- E. Tank shall be anchored as required by code and tank manufacturer. Provide suitably sized and number of anchors required and locate and anchor as appropriate in concrete slab foundation.

END OF SECTION

SECTION 33 56 43.17

FACTORY-ASSEMBLED ABOVEGROUND STORAGE TANK SYSTEM

PART 1-GENERAL

1.0 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.1 SUMMARY

- A. Provide factory assembled and integrated factory-assembled aboveground storage tank system with pre-plumbed dispensing systems, factory installed vents, valves and appurtenances. This specification requires that the system design, manufacture and integration to be the responsibility of one specialized manufacturer in order to maintain quality through the steps of procurement, manufacturer, integration and field installation. Non-factory assembled, substitutions are not acceptable, and will not be considered for this project.
- B. The tank system shall include a specialty fuel system sub-panel, emergency stop (ESO) and point-to-point wiring diagram to facilitate ease of installation for all system components.
- C. Certifications: Each tank and dispensing system storage tank shall bear the Underwriters Laboratories UL 2085 label for Protected Secondarily Contained Aboveground Tanks for Flammable Liquids.
- D. Delivery, Storage and Handling: Delivery to be coordinated to allow crane offloading and placement in prepared and final location minimizing the need for double handling. Keep tank system protected from physical damage caused by other construction activities.
- E. Field Measurements: Field-verify horizontal and vertical dimensions, clearances, and setbacks of spaces where tank systems will be installed prior to fabrication of tank under this section.

1.2 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the *applicable* requirements and standards addressed within the following references:
 - 1. NFPA 30 Flammable and Combustible Liquids Code.
 - 2. NFPA 30A Motor Fueling Dispensing Facilities & Repair Garages
 - 3. NFPA 70 National Electric Code.

- 4. UL 508A The UL Safety Standard for Industrial Control Equipment.
- 5. IFC 2012 Chapter 57 Flammable and Combustible Liquids
- 6. IFC 2012 Chapter 6 Building Services and Systems
- 7. IFC 2012 Chapter 23 Motor Fueling Dispensing Facilities & Repair Garages
- 8. PEI / RP 200 08 Recommended Practices for Installation of ASTs
- 9. ASTM A36 Standard Specification for Carbon Structural Steel
- 10. ASTM A53 Specification for Pipe, Steel, Black/Hot Dipped, Zinc Coated, Welded, SS
- 11. All applicable state and local requirements.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Equipment, controls and tank shall be provided by a single supplier to ensure a complete functional and coordinated system with single source responsibility. Supplier shall give guidance to equipment and tank installation and shall complete all commissioning and owner training. The supplier shall be a firm with five (5) years of documented experience in the installation of integrated dispensing fuel systems.
- B. All auxiliary components necessary to be integrated into the complete tank system shall be installed at the tank manufacturing facility.
- C. Installer: Company specializing in performing the work of this Section with minimum three (3) years documented experience. Bidding installation contractor shall hold license(s) as required by the AHJ.
- D. Tolerances: Coordinate fabrication and installation of tank system with adjacent building construction and verify critical dimensions, clearances, emergency stop (ESO) location and setbacks to ensure accurate installation.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Show details, sizes and dimensions, anchorage locations and accessory items.
 - 2. Furnish setting diagrams for installation as required.
 - 3. Where required by local jurisdiction, provide manufacturer's part numbers of integrated components, to facilitate permitting requirements of the tank system.
 - 4. Manufacturer to receive owner approval of shop Drawings prior to fabrication.
- B. Product Data:
 - 1. Provide catalog data on all controls, pumps, associated valves, piping, tanks and other equipment including material of construction, dimensional data and ratings.
 - 2. Submit complete installation instruction manual as published by the tank system manufacturer.
- C. Record Documents:

- 1. Record documents shall include as built Drawings indicating the location of tank system and system components.
- 2. Tank system start-up and commissioning check-lists and other applicable documentation shall be provided.
- D. Operation and Maintenance Data:
 - 1. Include manufacturers' installation, operation and maintenance instructions, spare parts lists, and training information for distribution and review in electronic format; when approved, a minimum of one complete O&M binder shall be provided for use on-site.

1.5 REGULATORY REQUIREMENTS

- A. Submit and comply with all the requirements of the EPA, state and local authorities having jurisdiction. Include installation permit/fees for fuel storage tank and all accessories and appurtenances.
- B. Comply with "National Electric Code" for equipment, wiring, and conduit installed under this section.

PART 2 - PRODUCTS

2.0 DISPENSING SYSTEM POWER DISTRIBUTION AND CONTROLS

The Safesite[™] DSC-100 Dispensing System Power Distribution and Controls. The DSC-100 is a single source power connection with dedicated power / control outputs to pumps, dispensers, control valves, fuel management system, tank gauging and monitoring, fire suppression, and other ancillary devices. The DSC-100 includes a monitored emergency stop. Each system comes with a specific tank, equipment, and conduit layout with point to point wiring diagrams. The system in its entirety shall be provided by Core Engineered Solutions, Inc. 518-635-4343 (NY) 800-628-5502 Head Quarters or approved equal.

The Safesite[™] DSC-100 Dispensing System Power Distribution and Controls shall be provided and shall integrate the following functions into one system:

- A. Control Panel Specifications
 - 1. Single input power connection with main power disconnects.
 - 2. NEMA 4X enclosure suitable for outdoor and high corrosion areas.
 - 3. Dedicated dispenser control and anti-siphon circuit.
 - 4. Dedicated fuel management control circuit.
 - 5. Dedicated tank level gauge circuit.
 - 6. Dedicated motor starter control and overload protection circuit (1-1/2 HP max).
 - 7. Dedicated 120V lighting circuit.
- B. Circuit Disconnects
 - 1. General. Each circuit leading to or through dispensing equipment, including all associated power, communication, data, and video circuits, and equipment for remote

pumping systems, shall be provided with a clearly identified and readily accessible switch or other approved means, located remote from the dispensing devices, to disconnect simultaneously from the source of supply, all conductors of the circuits, including the grounded conductor, if any. Single pole breakers utilizing handle ties shall not be permitted.

2.1 CONVAULT STORAGE TANK – DOUBLE WALL – DUAL COMPARTMENT 1,000 GALLON (500 GALLON GASOLINE | 500 GALLON DIESEL)

- A. Provide the rectangular **ConVault**[®] Aboveground Tank system constructed and listed in accordance with Underwriters Laboratories, Inc. (UL) Standard 2085, Protected Aboveground Storage Tanks for Flammable and Combustible Liquids. The tank system shall be listed for ballistics protection in accordance with UL Standard 752, Levels 5, 6 and 8.
- B. Code Compliance: The tank system must comply with all provisions of: 1) UFC 79-7, Appendix A-II-F, for both Vehicle Impact Protection and Projectile Resistance; 2) NFPA 30 and 30A; 3) IFC Chapter 57; and 4) IFC Chapter 23. The tank system shall be tested, certified and approved for Vapor Recovery by the State of California Air Resource Board (CARB) under Executive Order VR-302-B Standing Loss Control Recovery System for New Installations of Aboveground Storage Tanks effective 11/30/09.
- C. Warranty: The tank system shall be warranted by the manufacturer against defects in material or workmanship for 30 years following the delivery of the tank. Warranties that limit such coverage for shorter periods and/or limit the primary tank warranty to failure solely due to non-corrosion related cracking, breakup or collapse will not be permitted. See warranty documents.
- D. Quality Assurance: The tank system shall be manufactured and labeled in strict accordance with ConVault[®] standards as applied by a licensee of ConVault, Inc. The tank system shall be subject to the ConVault Quality Assurance Program.
- E. Tank: The tank shall be of double wall construction and provide secondary containment of the primary storage tank contents by an impervious steel outer wall. The tank shall be rectangular in shape and listed per UL Standard 142 and designed for possible future relocation. Welds shall be continuous on all sides and exterior seams, conforming to the American Welding Society Standard for continuous weld. The primary steel tank shall be pressure tested at 5 psig for a minimum of 24 hours. All openings shall be from the top only. The tank shall be supplied with emergency vents for the primary and secondary tanks.
- F. Secondary Containment and Corrosion Protection: The interstitial monitoring area between the primary and secondary tanks shall be a true void, insuring the immediate migration of any liquid contents to the monitoring point and reliability for verifiable pressure testing in accordance with the requirements of the Department of Defense Uniform Facilities Criteria 3-460-01 (Design: Petroleum Fuel Facilities) and 3-406-03 (Operations & Maintenance: Maintenance of Petroleum Systems). Designs incorporating insulation or other material in the secondary containment area will not be permitted. The secondary containment must be tested for tightness (at the manufacturing plant and in the field before commissioning and use as may be required by local jurisdiction and code). A 6 Mil High-Density Polyethylene liner shall enclose the double wall tank and insulating material to protect against corrosion by isolating the tank and secondary containment from the concrete or other corrosive material. Tank designs that do not protect the secondary containment from corrosion will not be permitted.

All exposed steel, with the exception of stainless steel, shall be anti-oxidant powder coated to inhibit corrosion and meet ASTM B117. Secondary containment comprised of an (unprotected) exposed outer steel jacket will not be permitted.

G. Concrete Encasement: A vaulted concrete enclosure shall encase and must protect both the primary and secondary containment steel tanks. The concrete encasement shall be 6" thick with a minimum design strength of 4000 psi. The concrete design shall include the following for long-term durability: air entrainment, water-reducing admixture, and steel reinforcement. Concrete placement shall be a visually verifiable monolithic (seamless) pour to ensure the absence of voids on all sides and beneath the steel tank. The double wall steel tank shall be pressurized to 5 psig during concrete encasement to allow for expansion and contraction of the tank.

The vault enclosure shall have concrete support legs of unitized monolithic construction raising the concrete enclosure a minimum of 3" above the ground to meet visual inspection requirements. A mid-level seam or other cold joint construction which could compromise the liquid tightness (secondary containment) and fire protection capability of the vault is not permitted.

- H. Thermal Protection: The tank system construction shall include thermal insulation by covering the double wall steel tank with a minimum of .25" thick (6.4mm) polystyrene panels to protect against extreme temperatures.
- Ballistics and High Explosive (HE) Blast Resistance: The tank system shall carry a listing under UL Ballistics Standard 752, Levels 5,6, and 8 (see table below), signifying bullet-resisting protection against penetration, passage of fragments of projectiles, or fragmentation of the vault enclosure to the extent that any protected material, including the secondary containment and primary tank are not damaged.

Ballistics Tests

UL 752		
Protection Level	<u>Shots</u>	Ammunition
Level 5	1	7.62mm Rifle Lead Core Full Metal Copper Jacket, Military Ball
		(.308 caliber)
Level 6	5	9.00mm Full Metal Copper Jacket with Lead Core
Level 8	5	7.62mm Rifle Lead Core Full Metal Copper Jacket, Military Ball
		(.308 caliber)

The tank system shall have been tested and passed the requirements to meet the following Ratings for Bullet Resistant Materials at a National Institute of Justice (NIJ)/ National Law Enforcement and Corrections Technology Center (NLECTC) approved laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP):

Rating	<u>Shots</u>	Ammunition
UL 752 Level 9	1	CAL .30 AP, M2, 166 gr.
National Institute of Justice (NIJ) Level 4	1	CAL .30 AP, M2, 166 gr
State Department (SD-STD02.01) Revision G	3	CAL .30 AP, M2, 166 gr
ASTM F-1233	3	CAL .30 AP, M2, 166 gr
Blast Effects Analysis (BEA)		-

The tank system design shall have been subjected to a Blast Effects Analysis (BEA) assessing resistance and performance under the following blast threat scenarios per the FEMA 426 - Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings: 1) a 50-pound manportable improvised explosive device (MPIED) at the standoff distance of 5 ft.; 2) a 500-pound vehicle-born improvised explosive device (VBIED) at the standoff distance of 20 ft.; and 3) a vapor cloud explosion (VCE) with a load of 10 psi. The BEA shall conclude that the tank system will resist the explosion loads and remain intact, without failure of the primary tank or movement of the tank exceeding 2".

Tank designs that do not protect the primary tank AND secondary containment by providing both Ballistics and Blast Effect resistance as specified in this Section 2.5 will not be permitted.

- J. Fire Resistance: The tank system shall be designed and tested to provide 2 hour fire protection for the primary tank as per UL 2085 2-hour furnace fire test and 2 hour simulated pool fire test. The average maximum rise in temperature of the primary tank during the test shall not exceed 260° F and the maximum temperature of any single point on the primary tank shall not exceed 400° F. No steel members shall penetrate the walls or floor of the concrete encasement to assure isolation from pool fire heat.
- K. Leak Monitoring: A thru-tank leak detection monitoring tube terminating between the primary tank and the secondary containment tank shall be provided to monitor any leaks from the primary tank.
- L. Manways: Both sides of the split tank shall have a manway for tank access.
- M. Emergency Vents: Both sides of the split tank shall be equipped with an emergency vent on the primary tanks. Secondary tank shall also be equipped with an emergency vent. Vents shall be sized and by the tank manufacturer per API 2000 7th Edition.
- N. Water Draw-Off: Both sides of the split tank shall be equipped with water draw-off connections with connected hand pumps capable of drawing water from the low side of each tank section into a bucket.
- O. Spill/Overfill Containment: The tank system shall include a UL listed 7 or 15 gallon spill/overfill container manufactured as an integral part of the primary tank, surrounding the fill pipe, and protected by 2 hour fire rating of the enclosure. The spill/overfill container shall include a stick port and normally closed drain valve to release spilled product into the main tank. Exterior steel shall be stainless steel or anti-oxidant powder coated to inhibit rust. Overfill containment systems that are designed to release spilled product into the interstitial area will not be accepted.
- P. Overfill Protection: Overfill protection shall be provided by the following methods: a) direct reading level gauge visible from fill pipe access; b) valve rated for pressurized delivery located within fill pipe to close automatically at 95% full level; and c) high level alarm.
- Q. Exterior Finish: The tank system exterior shall be a low maintenance architectural coating or exposed aggregate concrete finish. Models with fiber clad or painted steel exterior tanks will not be accepted.
- R. Signage: Tanks shall be marked on all sides as per state and local codes. Signs will be recessed in concrete exterior to insure against damage during off-loading, refilling or general functions.
- S. Mounting Hardware: The tank exterior shall include Unistrut with length of 24 inches, at a height of 18 inches and 36 inches from bottom of tank, centered on the front of tank. Tank exterior shall also include Unistrut with length of 24 inches, at a height of 18 inches and 36 inches from bottom of tank, located on rear left of tank.
- T. Execution: The tank system shall be installed in strict accordance with the manufacturer's recommendations, industry standards, and applicable fire and environmental codes. All state and local permits shall be obtained prior to installation. The tank system shall be handled, lifted, stored and installed in accordance with the manufacturer's instructions on a reinforced concrete base slab designed to support the fully loaded tank. Protective bollards shall be installed where required by state and local codes. Tanks shall be marked on all sides with warning signs and product identification as required by applicable codes. Grounding conductors shall be connected

to the two (2) bolts on the tank system for lightning protection in accordance with NFPA 780 and all electrical work shall be in accordance with applicable codes.

2.2 SUBMERSIBLE PUMPS

- A. Submersible fuel oil supply pumps shall be provided per the Project drawings (single or duplex).
- B. Configuration: 3/4 HP fixed speed, two-stage centrifugal type pump motor with integral, automatic, thermal overload protection requiring single-phase, 208-230 VAC, 60 Hz incoming power.
- C. Compatibility: UL listed for fuel mixtures containing up to 10% ethanol, and 20% MTBE, 20% ETBE or 17% TAME with gasoline.

Pump shall include Integral check valve, air eliminator, and pressure relief.

- D. Anti-siphon solenoid valve and ball/isolation valve at pump discharge.
- E. Model: Red Jacket P75U1RJ1 with accessories as indicated.

2.3 FUEL DISPENSER – FLEET / SINGLE REMOTE

- A. Fuel Dispenser shall be a shelf-mounted, enhanced capacity compact single remote dispenser, which is rated up to 22 GPM/83 LPM at the discharge. Designed for dispensing gasoline, including standard oxygenated blends; diesel, including biodiesel blends up to 20% (B20); and kerosene. The Fuel Dispenser shall include:
 - 1. Compact design, 31 inches high or less, that can be mounted on a shelf attached to the tank or on a remote shelf.
 - 2. Backlit 1.5" seven-digit volume LCD display and 1/2" four-character status LCD display.
 - 3. 7-digit electromechanical non-resettable totalizer. Electronic nonresettable and resettable 7-digit totalizers show on LCD using infrared control.
 - 4. All register openings shall be covered with tempered or double-strength glass (no plastic).
 - 5. Cabinet: All exterior panels made from galvannealed steel for corrosion resistance.
 - 6. Finish: Powder-coated metallic silver sides, top, and back with blue door with black register decal.
 - 7. Door, side, top, and back panels shall be removable for service access. Door shall be lockable.
 - 8. A hose hanger shall be provided to keep the hose off the island when not in use.
 - 9. One (1) positive displacement, stainless steel sleeved, two-piston meter with Teflon piston cups.
 - 10. An explosion-proof junction box shall be provided in the hydraulic cabinet to make all AC wire terminations.
 - 11. The junction box shall include a wire from the reset to provide a reset complete signal to an external control system.
 - 12. Minimum 1" I.D. internal piping for maximum flow performance.

- 13. The dispenser shall be equipped with a 1" two-stage solenoid valve.
- 14. Supply inlet shall be 1 1/2" minimum. Inlet strainer shall be able to be removed vertically to prevent spillage when cleaning.
- 15. Discharge shall be 1" with a ¾" reducing bushing so that either a ¾" or 1" hose may be used.
- 16. Nozzle boot shall be lane-oriented with lift-to-start nozzle hook to turn on/off dispenser.
- 17. Nozzle boot shall fit standard automatic or short spout balance vapor recovery nozzles.
- 18. Manufacturer's Warranty: One year parts and labor except for the cabinet which shall be warranted against corrosion for 4 years.
- B. Standards/Approvals: ADA compliant user controls per ANSI A117.1; C-UL-US listed; and W&M approval.
- C. Manufacturer: Wayne Select S1 Compact Model 3/G7107/2KH/J (Wayne, A GE Energy Business, Austin, TX).

2.5 TANK MONITORING SYSTEM

- A. Configuration: Electronic system includes high level, low level, leak indications, alarm panel, magnetostrictive tank gauging probe, discriminating leak sensor, Remote alarm and printer.
- B. Approvals: UL-listed, CUL-listed, CE-listed.
- C. Tank monitoring equipment shall connect to and be the same manufacturer of fuel site main tank gauging console (Pneumercator model TMS4000).

PART 3 - EXECUTION

3.0 EXAMINATION

- A. The tank system shall not be installed until substrates and adjacent construction has been properly constructed. Verify concrete tank slab, electrical service stub-ups, ESO location, bollard/barrier installation, clearances, setbacks, and other site related work that have impact to fueling system. Do not proceed until unsatisfactory conditions have been corrected.
- B. Notify Manufacturer of any detail or design deviations as may be determined by site conditions.

3.1 FUEL TANK INSTALLATION

- A. Install tank system in strict accordance with the manufacturer's recommendations, and applicable fire and environmental codes. State and local permits shall be obtained prior to installation.
- B. The legs of all tanks shall be anchored or grouted with non-shrink grout to the slab per manufacturer's recommendations. Engineered resilient pads interface may be used instead of grouting in accordance with the manufacturer's recommendations.
- C. Tanks shall be grounded in accordance with electrical codes. Use grounding lugs installed by tank manufacturer.

D. Tanks shall be clearly marked on all sides with warning signs "FLAMMABLE" or "NO SMOKING," tank volume, product identification, and other signs as required by local jurisdictions and applicable code.

3.2 ELECTRICAL SYSTEMS

- A. All wiring shall be designed and installed to meet the requirements of the NEC and NFPA 70. All necessary branch circuit conduit and wiring shall be installed, providing for a stub-up at designated location to which the turn-key tank fueling system can be connected. Install tank manufacturer provided specialty fuel system sub-panel (Model DSC-100) to facilitate ease of installation.
- B. All electrical devices used with or located within 20' of the tank system shall conform to NFPA 70 Hazardous Locations and Hazardous Area requirements on contract drawings. All electric conduits and wiring connected to the tank shall be explosion proof and in strict accordance with NEC Class-1, Division 1 or other local standards, whichever is stricter.
- C. Pumps and all other equipment and all other equipment used in the hazardous areas should be UL listed All wiring shall be designed and installed to meet the requirements of the NEC and NFPA 70. All necessary branch circuit conduit and wiring shall be installed as indicated on the Drawings.
- D. Pumps and all other equipment and all other equipment used in the hazardous areas should be UL listed.

3.3 FIELD QUALITY CONTROL

- A. Perform system inspection as outlined in manufacturer's installation manual.
- B. Test fueling distribution in accordance with NFPA 30 and other applicable codes. Properly dispose of any fuel generated in adherence to environmental regulations.
- C. Submit field installation inspection report to manufacturer Engineer.
- D. The final tank system installation shall be inspected and approved by the manufacturer or its certified contractor.

3.4 SYSTEM ACTIVATION

- A. Prior to activating the tank system flush system piping with grade of fuel to be used by Owner to remove any debris and foreign matter in piping prior to filling tank for the first time.
- B. Service all system filters and screens and dispose of fuel in accordance with EPA and NFPA regulations after flushing.
- C. Open valves to correct position for system operation.

3.5 ADJUSTING AND CLEANING

A. Touch-up any abraded areas with the application of same coating used by the manufacturer. Manufacturer to include sufficient quantity of touch-up paint for this purpose. B. Repair or replace damaged components.

3.6 OPERATIONAL TRAINING

A. Perform training of owner's personnel per the materials included with the tank system manufacturer's installation manual.

The Installation Contractor shall be responsible for the review of, and compliance with local requirements for system inspection, reporting and registration, as well as administrative paperwork requirements.

SECTION 337119

ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit and duct:
 - 1. Galvanized steel rigid metal conduit (RMC).
 - 2. Rigid polyvinyl chloride (PVC) conduit.
 - 3. High density polyethylene (HDPE) conduit.
- B. Accessories:
 - 1. Underground warning tape.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ASTM F512 Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation 2019.
- C. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- E. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- F. NEMA TC 6&8 Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations 2020.
- G. NEMA TC 7 Solid-Wall Coilable and Straight Electrical Polyethylene Conduit 2021.
- H. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 6 Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- J. UL 514B Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- K. UL 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- L. UL 651A Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for metallic conduit and nonmetallic conduit.
- C. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

- A. Galvanized Steel Rigid Metal Conduit (RMC): NFPA 70, Type RMC; comply with ANSI C80.1 and list and label as complying with UL 6.
 - 1. Manufacturers:
 - a. Allied Tube & Conduit: www.alliedeg.com/#sle.

337119 - Electrical Underground Ducts, Ductbanks, and Manholes
- b. Republic Conduit: www.republic-conduit.com/#sle.
- c. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- 2. Fittings: Comply with NEMA FB 1 and list and label as complying with UL 514B; steel or malleable iron, threaded type.
 - a. Manufacturers:
 - 1) Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - 2) O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - 3) Thomas & Betts Corporation: www.tnb.com/#sle.
 - Substitutions: See Section 260500 Electrical General and Section 012500 -Substitution Procedures.
- B. Rigid Polyvinyl Chloride (PVC) Conduit: NFPA 70, Type PVC; comply with NEMA TC 2 and list and label as complying with UL 651; Schedule 40 unless otherwise indicated; rated for use with conductors rated 90 degrees C.
 - 1. Manufacturers:
 - a. Cantex Inc: www.cantexinc.com/#sle.
 - b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - c. JM Eagle: www.jmeagle.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Fittings: Comply with NEMA TC 3 and list and label as complying with UL 651.
 - a. Manufacturer: Same as manufacturer of conduit to be connected.
- C. High Density Polyethylene (HDPE) Conduit: NFPA 70, Type HDPE; comply with NEMA TC 7 and list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.
 - 1. Manufacturers:
 - a. Blue Diamond Industries, LLC: www.bdiky.com/#sle.
 - b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - c. Dura-Line: www.duraline.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.

2.02 ACCESSORIES

- A. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.
 - b. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
- B. Underground Warning Tape: Polyethylene tape suitable for direct burial.
 - 1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brimar Industries, Inc: www.brimar.com/#sle.
 - c. Seton Identification Products: www.seton.com/#sle.
 - d. Substitutions: See Section 260500 Electrical General and Section 012500 Substitution Procedures.
 - 2. Legend: Type of service, continuously repeated over full length of tape.
 - 3. Color:
 - a. Tape for Buried Power Lines: Black text on red background.
 - b. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

3.02 DUCT BANK INSTALLATION

- A. Install power, communications, and fuel system electrical duct to locate top of ductbank as follows:
 - 1. Minimum 24 inches below finished grade for exterior underground applications.
 - 2. Under slab on grade: 12 inches to bottom of slab.
 - 3. Install 30 inches minimum below grade, below roads, and any other paved surfaces where indicated.
- B. Install duct with minimum slope of 4 inches per 100 feet (100 mm per 25.4 m) (0.33 percent). Slope duct away from building entrances.
- C. Cut duct square using saw or pipe cutter; de-burr cut ends.
- D. Insert duct to shoulder of fittings; fasten securely.
- E. Join nonmetallic duct using adhesive as recommended by manufacturer.
- F. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- G. Install no more than equivalent of three 90-degree bends between pull points.
- H. Provide suitable fittings to accommodate expansion and deflection where required.
- I. Stagger duct joints vertically in concrete encasement 6 inches (150 mm) minimum.
- J. Use suitable separators and chairs installed not greater than 4 feet (1200 mm) on centers.
- K. Band ducts together before backfilling.
- L. Securely anchor duct to prevent movement during concrete placement.
- M. Provide minimum 3 inch (75 mm) concrete cover at bottom, top, and sides of ductbank.
- N. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.
- O. Provide suitable pull string in each empty duct except sleeves and nipples.
- P. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
- Q. Interface installation of underground warning tape with backfilling. Install tape 6 inches (150 mm) below finished surface.

END OF SECTION

SECTION 406000 FUEL SYSTEM CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work of this section includes furnishing all labor, materials, tools, equipment and services required to the complete and proper installation of the Fuel Controls System.
- B. General Layout: Refer to contract drawings for general layout of equipment and locations.
- C. Discrepancies: Any discrepancies between drawings and specifications shall be brought to the engineer's attention as soon as possible.
- D. Provide final system performance verification to ensure that the system functions as intended. The system shall be capable of being run in 1) a manual mode or 2) in an automatic mode supplemented by manual operations.
- E. The control system shall include all control devices, sensors, transmitters, control panels, color-coded control wiring as specified and as required to fulfill the intent of these specifications. Coordinate all this work with the mechanical, electrical and fueling system specifications.
- F. Work of this section includes installation and/or programming of:
 - 1. Automatic Tank Gauging System
 - 2. EFSO System

1.02 SECTION INCLUDES

- A. Work provided under this Section includes, but is not limited to the following
 - 1. Custom-Fabricated Control Panels, including internal and face-mounted components a. Tank Valve Position Indicator Panels
 - 2. Automatic Tank Guaging
 - 3. EFSO Relays

1.03 RELATED SECTIONS:

- A. 013300 Compliance Submittal Requirements
- B. 260500 Electrical General
- C. 260533.13 Conduit for Electrical Systems
- D. 260533.16 Boxes for Electrical Systems
- E. 260553 Identification for Electrical Systems
- F. 335243.00 Fuel System General Provisions
- G. 335243.23 Fuel System Pumps
- H. 335243.31 Above Ground Aviation Fuel Bulk Unloading/Loading Skid Systems
- I. 407000 Fuel System Instrumentation

1.04 REFERENCES

- A. NECA 1 Standard for Good Workmanship in Electrical Construction; National electrical Contractors Association
- B. NEMA ICS 1 Industrial Control and Systems General Requirements, National Electrical Manufacturers Association
- C. NEMA ICS 4 Application Guideline for Terminal Blocks, National Electrical Manufacturers Association
- D. NEMA ICS 5 Industrial Control and Systems Control-Circuit and Pilot Devices, National Electrical Manufacturers Association
- E. NEMA ICS 6 Industrial Control and Systems: Enclosures, National Electrical Manufacturers Association

- F. NEMA 250 Enclosures for electrical Equipment (1000 Volts Maximum), National Electrical Manufacturers Association
- G. NFPA 70 National Electrical Code, National Fire Protection Association

1.05 SUBMITTALS

- A. See Section 01 33 00 Compliance Submittal Requirements for submittals procedures.
- B. Product Data:
 - 1. EFSO Relays Datasheets
 - 2. Automatic Tank Gauging Installation Instructions
 - 3. Custom-Fabricated Control Panels and components.
 - a. Tank Valve Position Indicator Panels

C. Shop Drawings:

- 1. Tank Valve Position Indicator Panels
 - a. Panel layouts for all custom-fabricated control panels.
 - b. All fabrication and erection drawings used for assembly and installation.
 - c. Detailed equipment installation drawings showing the proposed mounting and fastening details to structure.
 - d. Complete internal wiring diagrams for all control panels and electronic distributed control elements. Also provide all wiring schematics provided by the manufacturer.
 - e. External connection diagrams showing terminal block designations for all field wiring connections.
 - f. General outline drawings of all fabricated controls panels.
 - g. Nameplate list which conforms to the names used throughout the balance of the submittal.
 - h. Interconnecting diagrams for all devices and equipment.
 - i. Provide schematic diagrams for electrical items showing external connections, terminal block numbers, internal wiring diagrams, one-line diagrams and point to point wiring diagrams including wire identification numbers for all in-panel wire.
- D. Instructions
 - 1. Overall system maintenance and operation overall system instructions
 - 2. Instructions to installing contractor
- E. Quality Assurance
 - 1. Manufacturer's Instructions
- F. Closeout Submittals

1.06 QUALITY ASSURANCE

- A. Products Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
 - 1. Underwriter's Laboratories.

1.07 FIELD QUALITY CONTROL

- A. Provide the services of competent and effective manufacturer's field services as recommended by the manufacturer and as necessary to commission and turn-over the system to the Owner. No additions to the contract for these services shall be considered.
- B. Provide performance tests of all hardware supplied as part of the control system in accordance with manufacturer recommendations.

PART 2 - MATERIALS

2.01 CONTROL PANELS

- A. Custom-fabricated, hinged, gasketed control panel, meeting the requirements of 260533.16 -Boxes for Electrical Systems with the following noted features and/or exceptions.
- B. Mounting

- 1. Control Panels Wall Mount
- C. Enclosure Rating:
 - 1. Outdoor Panels NEMA 3R
- D. Dimensions:
 - 1. Size as required for equipment furnished, accounting for any future equipment specified or indicated on the drawings.
- E. Construction:

1

- Outdoor Control Panels
 - a. Enclosure minimum gauge: 10-gauge cold rolled steel.
 - b. Removable panels minimum gauge: 10-gauge cold rolled steel.
 - c. Doors minimum gauge: 12-gauge cold rolled steel.
- 2. Provide bracings, gussets and stiffeners, as required, to form a rigid, uniform structure without obstructing access to elements within the enclosure.
- F. Coating:
 - 1. All surfaces of control panels are to be painted. The painting system recommended by the supplier shall be submitted for approval to the Owner. Included in this submittal shall be the available color chart of not less than ten choices.
 - a. All inside and outside surfaces shall be shop prepared prior to painting. The degree of surface preparation shall be dependent on paint system used and service intended.
 - b. A minimum of two coats of sealing primer and surfacer inside and outside shall be provided.
 - c. One finish coat of appliance white on inside surfaces shall be provided.
 - d. A minimum of two coats of the exterior color approved by the Owner shall be provided on the outside surfaces including doors. Recommended color is ANSI Z55.1.61 Light Gray.
 - 2. Provide one pint each of both interior and exterior paint colors for use as touch-up paint. Provide to the Owner at final turnover.
- G. Doors:
 - 1. Front access door required: Yes
 - 2. Rear access door required: No
 - 3. Provide a print pocket to store all panel drawings.
 - 4. Provide 360-degree neoprene door gaskets.
 - 5. Door shall be fully grounding to the structure of the panel
- H. Nameplates
 - 1. See Section 26 05 53 Identification for Electrical Systems for nameplate requirements.
- I. Certifications & Markings
 - 1. Industrial Control Panels All industrial control panels as defined by Article 100 and Article 409 of the NEC shall be manufactured according to NEC requirements and marked as such by a UL508A-certified supplier.
 - Affix UL 508A label and add markings in accordance with NEC Article 409 (Manufacturers Name, Supply Voltage, Frequency, phases, full-load current for source, SCCR).
 - b. Submit, with all equipment product data, each applicable equipment item's SCCR.
- J. Face-Mounted Components
 - 1. As indicated on drawings.
 - 2. All LEDs shall be push-to-test.
- K. Interior Wiring Systems
 - The wiring systems within the control panel shall be provided as required for all connections to the individual elements within the panel. All wiring shall be type THHN/MTW rated at 105 degrees C at 600V. All DC wiring shall be as specified in 26 05 19 Low-Voltage Electrical Power Conductors and Cables. In addition to the wiring, the

Contractor shall provide the following:

- a. All necessary terminal blocks for external connections.
- b. The wiring methods employed by the Contractor are considered critical to the maintainability of the Panel. The Contractor shall follow the following criteria unless otherwise approved in writing by the Owner:
 - No wiring splices shall be allowed. All connections are to be made on equipment studs or terminal blocks. Except for shielded cables, bring all wiring requiring field connections out to terminal blocks conveniently grouped to receive the external cables. Wire all spare contacts on switches and relays to terminal blocks.
 - 2) Wiring shall be installed such that sufficient slack, or "hinge wire", exists in areas subject to flexing such as hinged panels, and doors.
 - 3) All connections made with insulated locking spade lug terminals except where devices specified are available only with solder-type terminals.
- L. Interior Overcurrent Protective Devices
 - 1. Provide fuses for LEDs. Size as required by manufacturer or contact ratings.
- M. Interior Ground Bar:
 - 1. Provide copper ground buss bar. Ground all components to ground buss bar as required by NEC and manufacturer's directions.

2.02 EFSO SYSTEM

- A. EFSO Function
 - 1. Actuation of any EFSO button shall disconnect pump power to all bulk loading/unloading motors via motor starter.
 - 2. EFSO reset by key only. See 407000 Fuel System Instrumentation , Control Devices.
- B. EFSO Relays
 - 1. Plug-in type general purpose control relays with coil voltage and number of contacts as required and as indicated on Drawings. Where the number of contacts required exceeds the number available on a single relay, provide cascaded relays. Provide with plug-in relay socket with numbered wire terminals corresponding to the relay pin numbers. Contacts shall be rated for a minimum 10 amps at 125 VAC.
 - 2. Approved Manufacturers:
 - a. Square D
 - b. Potter-Brunfield
 - c. Struthers-Dunn

2.03 AUTOMATIC TANK GAUGING

- A. Alarms
 - 1. The console shall be equipped with visual and audible alarm annunciation of the low, high and high-high level alarm conditions and interstitial leak condition. Console shall also include a push-to-test and alarm acknowledgement pushbutton located at each loading and unloading position.
 - Console shall be programmed for tank "high-level" alarm at 90% of tank capacity. Alarms shall not be interlocked with pump operation. At 95% of tank capacity, position switch on water slug valve shall activate adjustable timer relay. Timer relay will cause pump to lose permissive and stop the flow of fuel. See Section 335243.31 - Aboveground Aviation Fuel Bulk Unloading/Loading Skid Systems.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. The Contractor shall provide the services of an experienced service engineer to verify proper installation, calibrate instrumentation, assist in start-up and testing and instruct the Owner and Operator of the New Fueling System. Provide a minimum of (1) week (5 days, 1 trip) on site, but provide all reasonable increases in this minimum framework should the Owner and Operator feel that, in their judgment, that the training associated with this system of controls

has been incomplete or ineffective. The Contractor is responsible for training the individuals effectively - not just being on-site. Provide a plan for training, a schedule and a recommended list of attendees.

- B. The Contractor shall also provide the on-site attendance of representatives from the Controls System Supplier when judged necessary by the Owner's Representative, for the purposes of coordination, schedule and other such requirements. Costs associated with attendance on-site shall not increase the contract sum.
- C. The Contractor shall review all owner-furnished equipment submittals relating to the control of the fuel system.
- D. All trips to the site shall be coordinated with the Owner's Representative.
- E. Provide electronic copies of all recorded training sessions.

3.02 FABRICATION

- A. Accessibility
 - 1. The mounting of relays and other such devices shall allow access for maintenance of the devices without the dismantling of the panel. Install such devices on swing-out panels.

3.03 DELIVERY, HANDLING AND STORAGE

A. The Contractor shall provide factory shipping cartons for each piece of equipment and control device. Provide factory applied plastic end caps on each length of tubing. Maintain cartons and end caps through shipping, storage and handling as required to prevent equipment and tubing damage, and to eliminate dirt and moisture from entering equipment and lodging inside of tubing. Store equipment and materials inside an enclosure provided by Contractor and protected from weather.

3.04 INSTALLATION

- A. The installation of control hardware and the satisfactory operation of same shall be performed by those experienced in the installation and use of the equipment.
- B. Install a complete control system as specified, indicated, or required for proper and safe operation of the fueling system. All materials and workmanship shall comply with these specifications as a minimum; however, the Contractor shall conform to manufacturer's recommendations. Should a conflict arise between the specifications and the manufacturer's recommendations, the Contractor shall identify the issue as soon as the conflict arises and notify the Owner's Representative in writing.
- C. Install interior brackets and hinged equipment racks as necessary within control panels to allow for mounting and access of equipment. All interior support shelves used to support interior components shall be supported from subpanels or from the top of the control panel with rigid supports.
- D. The Contractor shall provide all openings in floors, walls, roofs, and other structures that are necessary but not necessarily shown on the drawings for complete equipment installation.
- E. All internal and external connections that are necessary to allow the system to function as specified shall be provided, tested and turned over to the Owner by the Contractor.

3.05 PROGRAMMING

A. Contractor shall be responsible for programming and integration of:
1. Automatic Tank Gauging System

3.06 EXAMINATION

A. The Contractor shall verify that all necessary, specified and provided systems are ready to be turned over to the Owner PRIOR to requesting that the Engineer perform final system evaluations. The Contractor is responsible for providing completed systems without dependence upon the Engineer or Owner's Representative.

3.07 STARTUP AND COMMISSIONING

A. Provide on-site startup and commissioning services per Section 33 52 43.24 - Fuel System Inspection, Testing, and Flushing. Allow enough time on-site to demonstrate full operation of the system to the Owner and Engineer, including normal operation of all systems, system alarms and interlocks.

3.08 TRAINING

- A. Training shall be provided to Owner (including the Fuel Operator's personnel) on all aspects of the control systems including the networking and the EFSO system. Training shall be conducted on the site with the system as installed. Training shall include systems maintenance and calibration. The training shall be provided during the first two months of the guarantee period as scheduled by Owner. Allow twelve hours for training. Coordinate with Owner to insure that multiple shifts are covered for all training activities.
- B. A training plan shall be provided to Owner for review and approval prior to scheduling the sessions.
- C. Training shall be scheduled with Owner.
 - 1. The operating and maintenance manuals shall be available for use during the training.
 - 2. Provide additional training as may be required or requested by Owner at additional cost. This training may be at the job site or at Contractor facilities as appropriate.

END OF SECTION

SECTION 407000 FUEL SYSTEM INSTRUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work of this Section shall be by Control System Supplier.
- This section applies to field-mounted process instrumentation and control devices only. For Β. panel-mounted devices and instruments, see Section 40 60 00 - Fuel System Controls.
- Work of this Section includes furnishing the equipment listed herein, and includes testing, and C. commissioning of these devices, in addition to others provided by other sections as shown on the drawings and as specified.
- D. Work provided under this section includes, but is not limited to the following:
 - 1 **Process Instruments**
 - Automatic Tank Gauging (ATG) System а
 - Tank Gauging Console 1)
 - Level Transmitters 2)
 - 3) **Temperature Transmitters**
 - 4) Interstitial Monitors
 - b. Flow Computers
 - Control Devices (Field-Mounted) 2.
 - a. EFSO Pushbutton and Signage
 - b. Pushbuttons
 - Switches C.
 - Horns d.

1.02 RELATED SECTIONS

- A. 013000 Administrative Requirements
- B. 013300 Compliance Submittals
- C. 260500 Electrical General
- D. 260533.13 Conduit for Electrical Systems
- E. 260533.16 Boxes for Electrical Systems
- F. 260553 - Identification for Electrical Systems
- G. 335243.15 Fuel System General Valves
- H. 335243.21 Fuel System Metering Equipment
- 335243.23 Fuel System Pumps Ι.
- J. 335243.00 - Fuel System General Provisions
- K. 335243.11 - Fuel System Piping Specialties
- L. 335243.16 - Aviation Fuel Control Valves
- M. 335643.15 Fuel System Aboveground Horizontal Tanks
- N. 33 52 43.27 Fuel System Unloading Skids

1.03 REFERENCES

- A. Comply with all standards which are applicable to the work of this Section, those identified herein below, and those listed in Division 1. Should more stringent requirements be demanded by the local authorities having jurisdiction, the requirements of these authorities shall take precedence provided they exceed the requirements of code.
- B. ISA S5.1 Instrument Society of American Instrument Symbols and Identification
- C. NFPA 70 National Fire Protection Association National Electrical Code (latest version)
- D. NEMA ICS 2 Industrial Controls and Systems

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1.04 SUBMITTALS

- A. See Section 260500 Electrical General.
- B. See Section 013300 Compliance Submittals, for submittal procedures.
- C. Product Data
 - 1. Process Instruments
 - 2. Fleld-Mounted Control Devices
- D. Shop Drawings
 - 1. Wiring Diagrams
 - a. Flow Computer Interconnection diagram for flow computer and associated equipment.
- E. Quality Assurance
 - 1. Test Reports
 - a. Provide performance tests of all hardware supplied as part of the control system in accordance with manufacturer recommendations.
 - 2. Manufacturer's Instructions
 - a. Provide the services of competent and effective manufacturer's field services as recommended by the manufacturer and as necessary to commission and turn-over the system to the Owner. No additions to the contract for these services shall be considered.

1.05 QUALITY ASSURANCE

- A. See Section 40 60 00 Fuel System Controls for approved Control System Suppliers.
- B. Products Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
 - 1. Underwriter's Laboratories.
- C. Provide products suitable in the application intended that is, a fuel system for combustible and flammable fluids in a critical application where failure of the control system could seriously compromise the use of the overall system. Provide a system which is reliable and complimentary to the nature of the application.

1.06 FIELD QUALITY CONTROL

PART 2 - MATERIALS

2.01 AUTOMATIC TANK GAUGING (ATG) SYSTEM

- A. Tank Gauging Console
 - 1. The console shall include microprocessor board, probe/sensor card, power supply, control I/O and communications interfaces. Front panel shall include user-friendly pushbutton controls, LCD display, audible and visual alarms.
 - 2. Console shall at a minimum be equipped with the following:
 - a. 6 magnetostrictive level probe inputs
 - b. 5 interstitial sensors
 - c. 4 relay outputs
 - d. 4 relay inputs
 - e. Ticket printer
 - 3. Console shall be NEMA 4X rated.
 - 4. Console shall be Pneumercator TMS4000 or approved equal.
- B. Level Transmitters
 - 1. Magnetostrictive
 - a. Provide a new automatic tank gauging (ATG) system as shown on the Drawings. Provide all hardware, software, programming and field services necessary.
 - b. Level Gauge/Probe

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- 1) The level gauging system must use a self-contained probe and transmitter to send digital indication of product level, interface and temperature to the tank gauging system. The level indicating system must require no periodic calibration after installation is complete.
- 2) The level indicating system must be approved for installation in a Class I, Division 1, Group D hazardous area and certified intrinsically safe by an approved agency and shall provide lightning protection integral to unit.
- 3) The level gauge shall have to ability to provide product, interface and temperature and have the ability to store a minimum of 100 points of a strapping table.
- 4) The level gauge shall have an integrated temperature sensing point.
- 5) Level gauge shall have a 3-inch S.S. mounting flange.
- 6) Acceptable Manufacturers:
 - (a) Pneumercator Magnetostrictive Probe MP450S.
 - (b) Approved equal.
- C. Interstitial Monitors
 - 1. Steel tank double-wall sensor shall be an electronic leak sensor utilizing electro-optic and conductivity technology to detect the presence of liquids in secondary containment applications.
 - 2. Sensor shall be intrinsically safe.
 - 3. Leak sensor shall activate with 1/2 inch of depth of fluid.
 - 4. Leak sensor shall be compatible with Pneumercator TMS4000..
- D. Overfill Alarm
 - 1. The overfill alarm shall be mounted as shown on drawings.
 - 2. Unit shall be of the same manufacture as the ATG system.
 - 3. The overfill alarm shall be provided with an alarm horn, strobe light and acknowledge switch.
 - 4. The overfill alarm shall be Pneumercator RA200KR with the following:
 - a. Power Module: Pneumercator RA200PM.
 - b. Remote Acknowledgement: Pneumercator RS2.

2.02 FLOW COMPUTERS

- A. Single-Arm type controller with integral keypad.
- B. Input Power: 120VAC (UPS). Provide the unit with all integral power supplies necessary to convert input voltage to that required by the unit's electronics.
- C. Enclosure: NEMA 4 / NEMA 7 suitable for use an outdoor, exposed, Class 1, Division 2 hazardous location.
- D. Temperature Rating: -10 to 60° Celsius.
- E. Communication
 - 1. Ethernet TCP-IP
- F. I/O: See drawings.
- G. Approved Manufacturers
 - 1. Smith Meter Microload
 - 2. Approved Equal

2.03 POSITION SWITCHES

A. For control valves: Provided by Section 33 52 43.16 - Fuel System Control Valves.

2.04 CONTROL DEVICES (FIELD-MOUNTED)

- A. For panel-mounted control devices, see Section 40 60 00 Fuel System Controls.
- B. EFSO Pushbuttons
 - 1. Operator: Red, jumbo mushroom, heavy-duty, oil-tight
 - 2. Factory-sealed, NEMA 3R (weatherproof), except where indicated on drawings.

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- 3. Contacts: (1) Normally Closed
 - a. Rated 10A continuous at 120VAC.
- 4. Actuation: Push
- 5. Reset: Keyed-reset
- 6. Approved Manufacturers:
 - a. Crouse Hinds Series EFS/EDS.
 - b. Allen-Bradley
 - c. Schneider Electric
 - d. Eaton
 - e. Square D
 - f. Approved equal
- C. Labeling and Signage
 - 1. Construction: 0.80-inch thick aluminum with white background. The sign shall feature screen printed copy on engineer-grade reflective vinyl sheeting suitable for exterior use.
 - 2. Size: 18" x 11.5"
 - 3. Lettering:
 - a. Font Eurostyle Bold Extended
 - b. Color Red
 - c. Height 2"
 - d. Text: first line EMERGENCY, second line FUEL SHUTOFF, third line PUSH.
 - 4. Approved Manufacturers:
 - a. Best Manufacturing Company
 - b. STANCO
 - c. Accent Signage Systems, Inc.
 - d. Approved Equal
- D. Pushbuttons
 - 1. For EFSO pushbutton Stations, see "Emergency Fuel Shutoff (EFSO) System" section of this specification.
- E. Horns
 - 1. Type: Single-Projection
 - 2. Construction: Copper-free (less than 0.3 of 1% copper) aluminum.
 - 3. Weather-resistant suitable for outdoor use.
 - 4. Sound Output: 100 dB at 10 feet minimum, adjustable.
 - 5. Voltage: 120VAC
 - 6. Approved Manufacturers
 - a. Pneumercator
 - b. Approved equal

PART 3 - EXECUTION

3.01 DELIVERY, HANDLING AND STORAGE

A. The Contractor shall provide factory shipping cartons for each piece of equipment and control device. Provide factory applied plastic end caps on each length of tubing. Maintain cartons and end caps through shipping, storage and handling as required to prevent equipment and tubing damage, and to eliminate dirt and moisture from entering equipment and lodging inside of tubing. Store equipment and materials inside an enclosure provided by Contractor and protected from weather.

3.02 INSTALLATION

A. Install a complete control system as specified, indicated, or required for proper and safe operation of the fueling system. All materials and workmanship shall comply with these specifications as a minimum; however, the Contractor shall conform to manufacturer's recommendations. Should a conflict arise between the specifications and the manufacturer's recommendations, the Contractor shall identify the issue as soon as the conflict arises and notify the Owner's Representative in writing.

- B. The Contractor shall provide all openings in floors, walls, roofs, and other structures that are necessary but not necessarily shown on the drawings for complete equipment installation.
- C. The Contractor shall place Dow Corning 3-6548 Silicone RTV, General Electric RTV850, or Chase-Foam CTC PR-855 foam in concrete walls, floor and roof slabs after installation of raceway and conduit serving the control system. In addition, the Contractor shall seal all holes provided for future connections and raceways.
- D. All floor-mounted equipment shall be installed level utilizing shims, and anchors adjoining floors or structures with bolts or cinch anchors.
- E. All internal and external connections that are necessary to allow the system to function as specified shall be provided, tested and turned over to the Owner by the Contractor.
- F. CONTROL WIRING
 - 1. Install all electric wiring in accordance with ANSI/NFPA 70, this specification and Division 26 (as applicable).
 - 2. Install control wiring, without splices between terminal points, using an assigned colorcode and numbered on both ends. Install in neat, workmanlike manner, securely fastened. Install in accordance with this specification and Section 33 52 43.75 (as applicable).
 - a. Install circuits over 25-volt with color-coded 90°F, 600 volt insulation, minimum No. 14 AWG wire, in conduit.
 - b. Install circuits under 25-volt with color-coded minimum No. 16 wire in conduit with high temperature (105°F (41°C) plastic insulation on each conductor and plastic sheath over all. Provide shielded cables where indicated on plans or where required by the instrument provided.
 - c. Provide wire markers on all control circuit wiring. Markers shall be as provided by Panduit Corporation, Brady, or accepted alternate. Wire markers shall be mechanically printed; hand written wire markers are not acceptable.
- G. EFSO SYSTEM
 - 1. Provide a legend plate for each device indicating "EMERGENCY STOP PUSH". Furnish mounting bracket, box and accessories as required for mounting to rack support structure.
 - 2. The EFSO stations shall consist of signage, supporting rack structure, grounding to rack and a push button station. The EFSO stations shall also consist of hardware and accessories.
 - 3. Mount sign above pushbutton 7-feet above grade and securely fasten to support device with stainless steel hardware. The sign located on building exterior, airside area, as shown on drawings shall be distinguishable from the other stations in that all sign and text dimensions shall be doubled and the sign shall be mounted 10 feet above grade.
- H. ALARM HORNS
 - 1. Mount as indicated but 8' high minimum. Horn shall be controlled from the tank gauging console.
- I. Field Test: When installation of the system is complete, calibrate equipment and verify operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the installer and witnessed by the Owner's Representative. Provide a detailed cross-check of each sensor within the system by making a comparison between the reading at the sensor and a standard traceable to the National Bureau of Standards.
- J. Check all control and signal wiring from source to field devices. As applicable, check all wiring for continuity and that they are free of shorts.
- K. Provide a cross-check of each control point within the system by making a comparison between the control command and the field controlled device. Verify that all systems are operable from local controls in the specified failure mode upon loss of power. Submit the results of functional and diagnostic tests and calibrations to the Owner's Representative for final system acceptance.

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L. At necessary points during construction and upon completion of the work, demonstrate system operation to Owner's designated representative, for verification of proper operation.

END OF SECTION

ITEM C-105 MOBILIZATION

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-2 Mobilization limit. Mobilization shall be limited to ten percent (10) of the total project cost.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Engineer/RPR field office. An Engineer/RPR field office is not required.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

- a. With first pay request, 25%.
- **b.** When 25% or more of the original contract is earned, an additional 25%.
- **c.** When 50% or more of the original contract is earned, an additional 40%.
- **d.** After Final Inspection, staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%.

BASIS OF PAYMENT

105-6 Payment will be made under:

Item C-105-6.1 Mobilization – per lump sum

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

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ITEM P-605 JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of D6690 or ASTM D7116. See plans for the location of the fuel resistant sealant.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be $25\% \pm 5\%$ larger in diameter than the nominal width of the crack.

605-2.3 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant. Separating or blocking media should be placed to a depth below the pavement approximately equal to the width of the joint.

For installation of light cans, backup materials shall not be used between Items P-605 and P-606. Can installation shall be per advisory circular (AC) 150/5340-30.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50° F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint. When used with P-606, such as light can installation, P-605 shall not be applied until the P-606 has fully cured.

If the pavement must be opened to traffic prior to placement of the sealant, this paragraph should be modified to require the Contractor to temporarily fill the joint with a jute or nylon rope immediately after the joint is sawed. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch (3 mm) below the pavement surface. The rope shall be removed immediately prior to cleaning.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the

joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

c. Sandblasting equipment. The Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the Resident Project Representative (RPR), that the method cleans the joint and does not damage the joint.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting, tractor - mounted equipment, concrete saw or water blaster as specified in paragraph 605-3.2.

The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted or waterblasted clean. Sandblasting or waterblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Care shall be taken to avoid scouring new pavement surfaces while sandblasting. Damaged pavement surfaces shall be repaired to the satisfaction of the Owner/Engineer at the Contractor's expense. Contractor shall prevent sand, dust, and other objectionable objects from leaving the project area or cease sandblasting operations when directed by the Owner/Engineer. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch $\pm 1/16$ inch below the pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material shall not be measured as a separate pay item.

BASIS OF PAYMENT

605-5.1 No separate payment for joint sealing material shall be made. Joint sealing material shall be considered incidental to P-501 Portland Cement Concrete (PCC) Pavement. Full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item shall be included in items listed for payment.

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes	
MATERIAL REQUIREMENTS		
AC 150/5340-30	Design and Installation Details for Airport Visual Aids	
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)	

ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END ITEM P-605

ITEM F-162 CHAIN-LINK FENCE

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence, gates and temporary fence in accordance with these specifications, the details shown on the plans, and in conformity with the lines and grades shown on the plans or established by the RPR.

MATERIALS

162-2.1 Fabric. The fabric shall be woven with a 9-gauge galvanized steel wire in a 2-inch mesh and shall meet the requirements of ASTM A392, Class 2.

162-2.2 Barbed wire. Barbed wire shall be 3-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A121, Class 3, Chain Link Fence Grade.

162-2.3 Posts, rails, and braces. Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

• Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

Posts, rails, and braces, with the exception of galvanized steel conforming to ASTM F1043 or ASTM F1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B117 as follows:

External: 1,000 hours with a maximum of 5% red rust.

Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Federal Specification RR-F-191/3.

162-2.4 Gates. Gate frames shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence.

162-2.5 Wire ties and tension wires. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A824.

All material shall conform to Federal Specification RR-F-191/4.

162-2.6 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153. Barbed wire support arms shall withstand a load of 250 pounds applied vertically to the outermost end of the arm.

162-2.7 Concrete. Concrete shall have a minimum 28-day compressive strength of 4000 psi.

162-2.8 Marking. Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the

name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

162-2.9 Aggregate Mow Strip.

- Aggregate material shall conform to the requirements of Aggregate Base AB-3 as specified in Section 3.12 of the City of Topeka Civil Specifications.
- Weed control material. A commercially available weed control material shall be applied at the manufacturer's recommended rate.
- Weed Prevention Fabric. Shall be a heavy-duty polypropylene fabric with a minimum weight of 4 ounces per square yard.

CONSTRUCTION METHODS

162-3.1 General. The fence shall be constructed in accordance with the details on the plans and as specified here using new materials. All work shall be performed in a competent manner, satisfactory to the RPR. The Contractor shall layout the fence line based on the plans. The Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences as shown on the plans. The Contractor shall stake down the woven wire fence at several points between posts as shown on the plans.

The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

162-3.2 Clearing fence line. Clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the plans. When shown on the plans or as directed by the RPR, the existing fences which interfere with the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.

The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

162-3.3 Installing posts. All posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans.

The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within seven (7) days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2 inches larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches. After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

162-3.4 Installing top rails. Not used.

162-3.5 Installing braces. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.6 Installing fabric. The wire fabric shall be firmly attached to the posts and braced as shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than one or more than 4 inches from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches or less.

Tension wire shall be installed along the top and bottom of the fence fabric attached with to fabric with hog rings at 2-foot centers.

162-3.7 Electrical grounds. Electrical grounds shall be constructed at 500 feet intervals. The ground shall be accomplished with a copper clad rod 8 feet long and a minimum of 5/8 inches in diameter driven vertically until the top is 6 inches below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

162-3.8 Aggregate Mow Strip. The mow strip shall be constructed in accordance with the details on the plans. Weed control material shall be applied over an area 2 feet wide centered on the fence line. Apply weed control material as recommended by the manufacturer's instructions and in compliance with state and local regulations. Weed prevention fabric shall be placed in the bottom of the trench, overlaps of material to be as recommended by the manufacturer's instructions. Place and compact aggregate over the prepared area.

162-3.9 Temporary Fence. The contractor shall set a 6 foot high temporary fence, held with sand bags, panels interconnected and connected to existing fence, as shown on the plans.

162-3.10 Cleaning up. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per T-901.

METHOD OF MEASUREMENT

162-4.1 7' chain-link fence with barbed wire, complete, including post and all incidentals, will be measured for payment by the linear foot. Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

162-4.2 Gates will be measured as complete units for each size range constructed.

162-4.3 Removal of existing fence, complete, will be measured by the linear foot.

162-4.4 Removal of existing gate will be measured by each.

162-4.5 Aggregate mow strip will be measured for payment by the linear foot. Measurement will include excavation, compacted subgrade, weed control and aggregate.

162-4.6 Temporary fence including fabric, posts, feet, sandbags will be measured by the linear foot. Measurement will be along the top of the fence from center to center of end posts.

BASIS OF PAYMENT

162-5.1 Payment for 7' chain-link fence with barbed wire, complete will be made at the contract unit price per linear foot.

162-5.2 Payment for gates will be made at the contract unit price for each gate.

162-5.3 Payment for removal of existing fence, complete will be made at the contract unit price per linear foot.

162-5.4 Payment for removal of existing gate will be made at the contract unit price per each.

162-5.5 Payment for aggregate mow strip will be made at the contract unit price per linear foot.

162-5.6 Payment for temporary fence will be made at the contract unit price per linear foot.

The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item F-162-5.1	7' Chain-Link Fence with Barbed Wire, Complete - per linear foot
Item F-162-5.2	Vehicle Gate, Manual Sliding (22' Wide) - per each
Item F-162-5.3	Vehicle Gate, Manual Sliding (26' Wide) - per each
Item F-162-5.4	Vehicle Gate, Manual Sliding (27' Wide) - per each
Item F-162-5.5	Vehicle Gate, Manual Sliding (30' Wide) - per each
Item F-162-5.6	Vehicle Gate, Manual Sliding (31' Wide) - per each
Item F-162-5.7	Pedestrian Swing Gate 6' Wide) – per each
Item F-162-5.8	Removal of Existing Fence, Complete – per linear foot
Item F-162-5.9	Removal of Existing Gate – per each
Item F-162-5.10	Aggregate Mow Strip – per linear foot
Item F-162-5.11	Installation and Removal of Temporary Fence – per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

	ASTM A392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
	ASTM A491	Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
	ASTM A824	Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence
	ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
	ASTM F668	Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and other Organic Polymer Coated Steel Chain-Link Fence Fabric
	ASTM F1043	Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
	ASTM F1083	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
	ASTM F1183	Standard Specification for Aluminum Alloy Chain Link Fence Fabric
	ASTM F1345	Standard Specification for Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
	ASTM F1665	Standard Specifications for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence
	ASTM G152	Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
	ASTM G153	Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
	ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
	ASTM G155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials
Federal	Specifications (FED SP	EC)
	FED SPEC RR-F-191/3	Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
	FED SPEC RR-F-191/4	Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)
EAA CO	andord	

FAA Standard

FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding
	Requirements for Facilities and Electronic Equipment

FAA Orders

5300.38 AIP Handbook

END OF ITEM F-162

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ITEM F-163 WILDLIFE DETERRENT FENCE SKIRT

DESCRIPTION

163-1.1 This item shall consist of furnishing and installing chain-link fence fabric underground or a wildlife deterrent skirt similar to Dig Defence as manufactured by Dig Defence, LLC, or equal, along new chain link fence. Material used shall be at the contractor's option, however, the same material shall be used throughout the project, except at locations shown on the plans where a specific product is called out. These materials shall be paid for as Anti-Burrow Barrier. Connections from the new fence to the anti-burrow barrier should be in accordance with the specifications herein, or manufacture's recommendations. The installation shall be in accordance with these specifications, manufactures recommendations and the details shown on the drawings and in conformity with the lines and grades shown on the plans or established by the RPR.

MATERIALS

163-2.1 Anti-Burrow Deterrent

a. Chain link fence fabric. The fabric shall be woven with a 9-gauge galvanized steel wire in a 2-inch mesh and shall meet the requirements of ASTM A392, Class II. The fabric shall be 5 feet wide.

b. Manufactured Anti-Burrow Barrier. Commercially manufactured product similar to Commercial Grade Dig Defence drive-in-ground fence panels as manufactured by Dig Defence, LLC, or similar product. Product shall be a minimum of 4-gauge galvanized steel rods with 1 1/2" spacing, minimum of 15" depth.

163-2.2 Barbed wire. Not Used.

163-2.3 Wire ties and tension wires. Wire fabric ties, wire ties, and tension wire for a given type of fabric shall be the same material as the fabric type. The tension wire shall be 7-gauge coiled spring wire coated similarly to the respective wire fabric being used.

Wire fabric ties shall be hog rings of galvanized steel wire not less than 9-gauge.

All material shall conform to Federal Specification RR-F-191/4.

163-2.4 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the fitting or hardware, and sufficient in strength to provide a balanced design when used with fabric, posts, and wires of the specified quality. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153.

163-2.5 Concrete pads at gates. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 4,000 psi.

163-2.6 Marking. Each roll of fabric shall carry a tag showing the kind of base metal, kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal, and kind of coating.

163-2.7 Weed control material. See F-162 Chain-Link Fence.

CONSTRUCTION METHODS

163-3.1 General. The fence shall be constructed in accordance with the details on the plans and as specified here using new materials. All work shall be performed in a workmanlike manner satisfactory to the RPR. The Contractor shall layout the fence line based on the plans. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

163-3.2 Clearing fence line. All brush, stumps, logs, and other debris which would interfere with the construction of the fence shall be removed on either side of the fence centerline before starting fencing operations. The material removed and disposed of shall not constitute a pay item and shall be considered incidental to fence construction.

163-3.3 Installing fabric. Excavate ground to the depth required for proper installation of the fabric. Obtain RPR's approval of depth of excavation before placing the wire fabric. Place the fabric and lap splice it to existing fence fabric and tie with wire ties at 2-foot spacing. Cut wire fabric around fence post footing to allow proper placement. Backfill with native soil to original grade and compact. Gate concrete pads shall be installed at each gate or as shown on the plans.

163-3.4 Weed control application. See F-162 Chain-Link Fence.

163-3.5 Electrical grounds. See F-162 Chain-Link Fence.

163-3.6 Cleaning up. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per Item T-901.

METHOD OF MEASUREMENT

163-4.1 Anti-Burrow Barrier. Chain-link fence fabric or manufactured anti-burrow barrier shall be measured for payment by the linear foot to the nearest foot. Measurement shall be along the fence from center to center of end or corner posts, excluding the length occupied by gate openings.

BASIS OF PAYMENT

163-5.1 Anti-Burrow Barrier. Payment for anti-burrow barrier shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing materials, all labor (including preparation, excavation, backfill, fill, and installation), equipment, tools, and incidentals necessary to complete this item. Utility locates shall be included in this pay item.

Payment will be made under:

Item F-163-5.1 Anti-Burrow Barrier - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire

ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
Federal Specifications (FED SPEC)
FED SPEC RR	-F-191/4 Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)
FAA Standard	
FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment
FAA Orders	
5300/38	AIP Handbook

END OF ITEM F-163

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CITY OF TOPEKA and SHAWNEE COUNTY

STANDARD TECHNICAL SPECIFICATIONS





City of Topeka

Shawnee County

2013 Edition (REVISED MAY, 2016)



CITY OF TOPEKA

Department of Public Works Engineering Division 620 SE Madison St., 2nd Floor Topeka, KS 66607 Brian Faust, City Engineer Email: bfaust@topeka.org Tel: (785) 368-3842 Fax: (785) 368-3881

October 29, 2018

TO: ALL HOLDERS OF THE CITY OF TOPEKA AND SHAWNEE COUNTY STANDARD TECHNICAL SPECIFICATIONS

RE: 2013 EDITION - REVISIONS FOR 2018

The following revisions have been made to the City of Topeka and Shawnee County Standard Technical Specifications:

Table of Contents - REPLACE - SECTION 8 Water

Section 8 – Water Mains, Fire Lines and Water Service Laterals This section has been revised – replace whole section

<u>Detail Sheets – Replace</u> DT-020 Erosion & Pollution Control DT-021 Erosion & Pollution Control DT-023 Water Details I DT-024 Water Details II

Traffic Details - Replace DT-100 Wiring & Phasing Details DT-101 Bill of Materials DT-102 Controller Pad, etc. DT-103A & B Mast Arm Pole Details DT-104 Mast Arm & Base DT-105 Traffic Signal, etc.

Replace the Standard Detail Name Sheet

Thank you

Brian Faust, City Engineer BF:bp


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Asphalt Concrete Pavement Details	DT-001	03-2013
Concrete Pavement Details	DT-002	03-2013
Curb & Gutter and Approach Details	DT-003	03-2013
Ramp & Walk Details	DT-004	05-2016
Standard Manhole Details	DT-005	03-2013
Manhole Rehabilitation Details	DT-006	02-2008
Sanitary Sewer Details	DT-007	03-2013
Storm Sewer Details	DT-008	03-2013
Type I Inlets	DT-009	03-2013
Type I-P Inlets	DT-010	03-2013
Type II-P Inlets	DT-011	12-2009
Ditch Inlets	DT-012	02-2008
Type II-P Area Inlet Manhole	DT-013	02-2008
Channel Linings	DT-014	02-2008
Pipe Outfalls	DT-015	02-2008
Wash Check, Trickle Channel & Flume	DT-016	02-2008
Miscellaneous Details I	DT-017	03-2013
Miscellaneous Details II	DT-018	12-2012
Typical Project Signing	DT-019	03-2013
Frosion & Pollution Control - Inlet Protection & Genera	al Notes DT-020	07-2018
Frosion & Pollution Control – Silt Fence Sediment Tra	n	07-2010
and Construction Entrance	P DT-021	07-2018
Miscellaneous Details III	DT-021	03-2013
Water Details I	DT-022	07-2018
Water Details I	DT-023	07-2018
	DIULI	07 2010
TRAFFIC DETAILS		
Wiring, Timing & Street Name Signs	DT-100	10-2017
Bill of Materials	DT-101	08-2018
Controller Pad, Junction Box, Service Box, and Loop	7	
Installation Details	DT-102	10-2017
Mast Arm Pole Details	DT-103A,B	10-2017
Mast Arm, Base, and Power Feed Details	DT-104	10-2017
Traffic Signal Pedestal, Power Service Details, and		
Concrete Base Details	DT-105	10-2017
Traffic Signal Specifications	DT-106	01-2010
Traffic Signal Specifications	DT-107	01-2010
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Traffic Signal Specifications	DT-111	07-2010
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Traffic Control	DT-118	02-2012
Traffic Control	DT-110	01-2012
Traffic Control	DT-120	01-2012
Traffic Control	DT-121	01-2012
(located in Traffic Engineering Section)	D1-121	01-2012
(located in Hame Engineering Section)	DOW Comidar 2 Mod	al POW Corridor 4



CITY OF TOPEKA

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May 18, 2016

TO: ALL HOLDERS OF THE CITY OF TOPEKA AND SHAWNEE COUNTY STANDARD TECHNICAL SPECIFICATIONS

RE: 2013 EDITION - REVISIONS FOR 2016

The following revisions have been made to the City of Topeka and Shawnee County Standard Technical Specifications:

Updated the Table of Contents page numbers for Section 5 and Section 8

Updated Standard Details: Revision 7 on Ramp & Walk Details DT-004, Added New Details: Water Details 1 DT-023 and Water Details 2 DT-024

Section 5 - CONCRETE PAVEMENT AND STRUCTURES

5.01 CONCRETE B. <u>Materials.</u> (2) <u>Aggregates</u>. Updated TABLE 5.01B (2)ii to show revised gradation for coarse aggregate in Pavement Class – A Concrete.

Section 8 - WATER MAINS, FIRE LINES AND WATER SERVICE LATERALS

This section has been revised – replace whole section

Shawn P. Bruns City Engineer

SB:bp

attachments



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SECTION 1

GENERAL

1.01 SCOPE.

A. <u>Intent.</u> The intent of the Drawings and these Specifications is to describe a functionally complete Project (or part thereto) to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether specifically called for or not. The Contractor shall provide for the execution and completion in every detail of the work described herein. It is understood that the Contractor, for all or any part, will furnish all labor, material, equipment, tools, transportation and necessary supplies such as may be required to complete the project in a satisfactory and workmanlike manner in accordance with the Drawings and Specifications.

B. <u>Taxes.</u> The Contractor shall pay all legally required sales, consumer and use taxes. Refer to Section 700 General Conditions, Article 6.15 for the requirements for sales tax exemption on City or County funded projects.

C. <u>Permits.</u> The Owner will obtain and pay for permits and / or clearances from the U.S. Army Corps of Engineers (Corps), Kansas Department of Health Environment (KDHE), Kansas State Board of Agriculture Division of Water Resources (DWR), and Kansas Department of Wildlife and Parks (KDWP) unless specified otherwise in the Contract Documents. For developer projects, located on either private or public property, the developer is responsible for obtaining and paying for these permits.

Ownership of the "Kansas Water Pollution Control General Permit and Authorization to Discharge Stormwater Runoff from Construction Activities, NPDES" obtained from the KDHE shall be transferred from the Owner to the Contractor unless specified otherwise in the Contract Documents. This transfer shall be completed by the Contractor's submittal of an executed copy of the "Notice of Transfer of Ownership" (NOTO) to KDHE prior to the issuance of the Start Work Order. When the soil disturbing activity is completed, all areas are restored, and all requirements of the permit are complete, the Contractor must submit a Notice of Termination (NOT) form to KDHE to terminate the authorization to discharge. The Stormwater Pollution Prevention Plan is a part of the Project Documents. If the project is not completed within the period covered by the permits, the Contractor shall apply and pay for any necessary permit extensions.

The Contractor shall obtain and pay for all other required licenses and permits.

For projects within the City Limits of Topeka and within public right-of-way, a "Traffic Disruption Permit" is required prior to the start of work. This permit may be obtained by contacting the City of Topeka Engineering Division – Traffic Section at phone number (785) 368-3842 a minimum of 72 hours in advance of starting work.

D. <u>24 Hour Contact.</u> The Contractor shall file with the City Engineering Division and/or Shawnee County Director of Public Works, the names, addresses and phone numbers of two or more responsible persons in the Contractor's organization who shall be on call at all times.

E. <u>Emergency Project Identification Sign.</u> The Contractor, at the discretion of the Engineer, shall erect an Emergency Project Identification Sign in a prominent place at the project site or at both ends of the project site. The sign shall have legible printed letters and figures not less than three (3) inches high showing the name of the Contractor and the phone numbers of responsible personnel for day or night emergency contact. The Emergency Project Identification sign shall not be paid for directly, but shall be subsidiary to other items of the Contract.

F. <u>Notification to City or County.</u> The Contractor shall provide a minimum of 72 hours advance notice to the City of Topeka Engineering Division, Construction Management Section and/or Shawnee County Director of Public Works prior to beginning work on City/County right-of-way.

G. <u>Notification to Property Owners.</u> The Contractor shall notify all the owners of property adjacent to the Construction and those property owners that will experience disruption and changes in access to their property a minimum of 48 hours prior to the start of construction or the changing of roadway access points. Information shall include construction start and finish dates; project number and description; company name and phone number; and superintendent's name and phone number.

H. <u>Public Convenience.</u> The Contractor shall cooperate with the owners of adjacent properties in the protection of their property. Access to driveways, houses and buildings, and temporary road and entrances and crossings of streets and sidewalks shall be provided, and kept in good condition, unless otherwise directed by the Engineer.

1.02 SPECIFICATIONS.

Throughout these Standard Technical Specifications, the specifications of other agencies and accredited authorities for quality of materials and standards of practice will be referred to by their initials with the specific reference indicated by the respective reference's section number. It shall be understood that, unless specifically noted otherwise, the latest edition of the reference at the time of advertising for bids shall govern.

Reference Init	ial Reference
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
KDOT	Kansas Department of Transportation
MUTCD	Manual on Uniform Traffic Control Devices, US Department of Transportation
OSHA	Occupational Safety and Health Administration
SSPC	Steel Structures Painting Council

The *Standard Specifications for State Road and Bridge Construction, Edition 2007* published by the Kansas Department of Transportation is referenced throughout these Standard Technical

Specifications and is referred to as the "KDOT Standard Specifications." This shall mean the KDOT Standard Specifications as bound and published in 2007 and shall not include KDOT Special Provisions unless specific reference is made to a KDOT Special Provision.

1.03 CONFLICT IN DRAWINGS AND SPECIFICATIONS OR DOCUMENTS.

Where a discrepancy may exist between Drawings, Specifications, etc., the order of precedence shall be as follows:

- A. Supplementary Conditions
- B. Drawings
- C. The City of Topeka and Shawnee County Standard Technical Specifications
- D. Other specifications incorporated by reference

1.04 PHYSICAL DATA.

With the exception of the site specific recommendations for treatment and preparation of subgrades as may be contained in a Geotechnical Report, any physical data in regard to subsoil, rock, water table or other site conditions, which are noted on the Drawings or Reports or referred to herein, represent conditions as of the date of their determination and are for information only. Any reliance by the Contractor on such data will be at the Contractor's risk.

1.05 SHOP DRAWINGS AND ENGINEERING DATA.

A. <u>Schedule of Shop Drawing Submissions</u>. Prior to the date of the Preconstruction Conference, the Contractor shall submit to the Engineer a schedule of Shop Drawing submissions which shall include the items of materials and equipment for which shop drawings are required by the specifications. For each required shop drawing, the date shall be given for intended submission of the drawing to Engineer for review and the date required for its return to avoid delay in any activity beyond the scheduled start date. Sufficient time shall be allowed for initial review, correction and resubmission, and final review of all shop drawings. Unless agreed otherwise, Engineer's submittal review period shall be 21 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in Engineer's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period. In no case will a schedule be acceptable which allows less than 10 days for each review by Engineer.

B. <u>Submittal Requirements.</u> After checking and verifying all field measurements, the Contractor shall submit to the Engineer, for review and approval in accordance with the accepted schedule of Shop Drawing submissions, five copies (or 2 copies and an electronic PDF copy if requested by the Engineer) of all Shop Drawings, which will bear a stamp or specific written indication that the Contractor has satisfied their responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as the Engineer may require.

The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Engineer to review the information. The Contractor shall also submit to the Engineer for review and approval

with such promptness as to cause no delay in the Work, all samples required by the Contract Documents. All samples will be identified clearly as to material, supplier, pertinent data such as catalog numbers, and the use for which intended.

Before submission of each Shop Drawing or sample, the Contractor shall have determined and

verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

At the time of each submission, the Contractor shall give the Engineer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Engineer for review and approval of each such variation.

C. <u>Engineer's Review.</u> The Engineer will review and approve with reasonable promptness Shop Drawings and samples, but the Engineer's review and approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. The Engineer's review and approval of Shop Drawings or samples shall not relieve the Contractor from responsibility for any variation from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to each such variation at the time of submission and the Engineer has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by the Engineer relieve the Contractor from responsibility for any or sample approval; nor will any approval by the Engineer relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of the Contract.

When the drawings and data are returned marked "REJECTED - SEE REMARKS" or "REVISE AND RESUBMIT", the corrections shall be made as noted thereon and as instructed by the Engineer and five corrected copies resubmitted. Facsimile (fax) copies will not be acceptable.

When the drawings and data are returned marked "MAKE CORRECTIONS NOTED" or "NO EXCEPTIONS TAKEN", no additional copies need be furnished unless requested by Engineer at time of review.

D. <u>Re-submittal of Drawings and Data.</u> The Contractor shall make corrections required by the Engineer, and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review and approval. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the Engineer on previous submittals. The Contractor shall accept full responsibility for the completeness of each resubmittal. The Contractor shall verify that all corrected data and additional information previously requested by the Engineer are provided on the resubmittal.
When corrected copies are resubmitted, the Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by Engineer on previous submissions.

Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A.B. etc.) to indicate the sequence of the resubmittal.

If more than one resubmission is required because of failure of the Contractor to provide all previously requested corrected data or additional information, the Contractor may be required to reimburse the Owner for the charges of the Engineer for review of the additional resubmissions. This does not include initial submittal data such as shop tests and field tests which are submitted after initial submittal.

Re-submittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining the Engineer's review of submittals, will not entitle Contractor to an extension of the Contract Time unless delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of the Engineer to review any submittal within the submittal review period specified herein and to return the submittal to the Contractor.

1.06 CONTRACTOR USE OF PREMISES.

The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and areas permitted by the Contract Documents and other areas permitted by Laws and Regulations, rights-of-way, permits and easements. The Contractor shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Equipment and materials shall not be stored in traffic control buffer zones, clear zones, or the site triangles of intersections open to traffic.

The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any land or areas contiguous thereto, resulting from the performance of the Work. Any additional work or storage areas shall be obtained and paid for by the Contractor. Copies of the agreement signed by the property owner shall be provided to the Engineer prior to use of additional areas. The Contractor shall assume full responsibility for the protection and safekeeping of all materials that are stored on the construction site

1.07 DAMAGE TO PREMISES.

The Contractor shall be responsible for the repair or replacement of any public or private property which is damaged by the Contractor's operations and which is not shown on the Drawings to be removed.

1.08 CLEAN-UP.

A. <u>Construction Requirements.</u> Clean-Up is considered an integral part of the work. As the work progresses, the working area shall be kept clean of trash, debris, and junk, and promptly restored to a condition equal to or better than that prevailing before construction.

B. <u>Payment Withheld</u>. At the Engineers discretion, but with advance notice to the Contractor, payment may be withheld for otherwise completed items of work in areas where Clean-Up is not completed. The Contractor may submit to the Engineer, in writing, a request for the release of withheld payments. The request shall include a statement of the reasons why Clean-Up is incomplete and a schedule for prompt completion. Withheld payments may be released to the Contractor based on the Engineer's opinion of the acceptability of the Contractors reasons Clean-Up is incomplete and the Contractor's schedule to complete the Clean-Up work. Clean-Up shall not be paid for directly, but shall be subsidiary to other items of the Contract.

1.09 SANITATION.

The Contractor shall furnish and pay for temporary toilet facilities for the use of their employees and shall maintain the same in a clean and sanitary condition. These facilities must be in place prior to the start of construction. The Contractor shall not create or permit any nuisance to the public or to residents in the vicinity of the work. Facilities shall be serviced regularly and maintained so as to not constitute a nuisance or health hazard.

1.10 TRAFFIC CONTROL.

Contractor shall comply with all pertinent vehicular and pedestrian traffic control prequirements set forth in Section 4 of these Standard Specifications, the Project Documents, and as directed by the Engineer. All barricades, signs, lights and traffic control devices of any nature shall conform with the requirements of the MUTCD. All Projects within public right-of-way require traffic control. The Contractor shall provide traffic control unless indicated otherwise in the Project Documents, in which case the Owner shall provide traffic control.

1.11 MEASUREMENT AND PAYMENT.

All work to be performed under this contract will be paid for at the lump sum or unit prices stated on the Bid Form. Unit price payments will be based upon measurement of completed and accepted items as hereinafter described. Payment for unit price items and lump sum items shall constitute full compensation for all labor, materials, tools, equipment and incidentals required to complete the work, as described in accordance with the Drawings and Specifications. Any material, equipment or operation not specifically mentioned shall be considered to be incidental to the unit price or lump sum pay item to which it pertains.

1.12 CONSTRUCTION SURVEYING.

A. <u>Responsible Party.</u> The Owner, the Engineer, or the Design Engineer shall provide construction surveying to establish reference points, benchmarks and construction layout staking of the following listed improvements at no cost to the Contractor unless the item "Contractor Construction Staking", as specified in Section 4, is included as a Pay Item of Work in the Contract Documents. The responsible firm or agency for construction surveys, referred to herein as the "Construction Surveyor," will be identified at the Pre-Construction Conference.

Construction Staking Items:

- Alley Pavement (See Note 2)
- Channel and Ditch Lining Pavements (See Note 2)
- Commercial Drive Entrances (See Note 2)
- Critical Pavement Intersections (See Note 4)
- Curb & Gutter (See Note 2)
- Parking Lot Grading, Rough Finish Grade and Final finish Grade (See Note 5)
- Pavement Crowns (See Notes 2 and 3)
- Pavement Removal Saw Cut Marking (See Note 10)
- Sanitary Sewer Piping, Manholes, and Structures (See Note 6)
- Sidewalks (Notes 2 and 9)
- Sidewalk Retaining Walls, Retaining Walls (See Notes 2 and 9)
- Special Ditches and Channels (See Notes 7 and 11below)
- Storm Sewer Conduits, Inlets, Manholes, Outfalls, Headwalls and Structures (See Note 6)
- Street Pavement Centerline with Rough finish Grade (See Notes 1 and 8)
- Survey Monument Boxes (See Note 10)
- Traffic Signal Poles, and Appurtenances (See Note 10)
- Valley Gutter (See Note 2)
- Water Line Piping and Appurtenances (See Note 7)

(All offset stake elevations will use the Cut or Fill method. "Blue-top" staking will be at location and will not be provided for any item other than elevation critical areas for Critical Pavement Intersections, as agreed to by the Construction Surveyor.)

Note 1: To be staked on Centerline, at 50 feet intervals, or as agreed by the Construction Surveyor. To be used also as control line for clearing limits.

Note 2: To be staked on offset, at 25 feet intervals, also at critical horizontal and vertical points such as PC's, PT's, ECR's, PVC's and PVT's. Radius points will be set for radii 60 feet or less, where practical. Cuts and Fills will be marked to finished pavement elevation, or top of curb. Critical drainage slopes of less than 0.6% may be marked to flow line instead of top of curb.

Note 3: Pavement Crowns generally will not be staked for a consistent standard-cross section residential pavement, except as agreed by the Construction Surveyor.

Note 4: To be staked at location, or on offset. If intersection pavement elevations are critical to establish positive drainage or a comfortable travel ride, blue-top stakes at location may be provided, as agreed by the Construction Surveyor. Offset stakes will use the Cut and Fill method.

Note 5: Rough Finish Grading to be staked at location, on a 50 feet grid. Critical Final Staking Elevations may be provided on a 25 feet grid, as agreed to by the Construction Surveyor. Cuts and Fills will be marked to finished pavement elevation. Note 6: To be staked at structures and deflection points, with stakes on offsets at 25 feet intervals for first 100 feet, then at 100 feet intervals up to next structure or deflection point. Cast-in-place conduits such as Reinforced Concrete Boxes will be staked on offset, at 25 feet intervals and at horizontal and vertical deflection points.

Note 7: To be staked at horizontal and vertical deflection points and critical elevation points, on offsets at 25 feet or 50 feet intervals, as agreed to by the Construction Surveyor.

Note 8: Street side slope-staking for slopes of less than 4:1, or cuts and fills of less than 4 feet will not generally be provided, unless agreed to by the Construction Surveyor.

Note 9: Staking will be provided only for sidewalks with the near edge no closer than 8 feet from the back of curb, or not parallel with the Back or Top of Curb. Handicapped Ramps will generally be constructed by the Contractor to lines and elevations as approved by the Engineer, without staking.

Note 10: To be staked at location.

Note 11: To be staked at 25 feet or 50 feet intervals, depending on critical grade, and at critical elevation or deflection points, as agreed to by the Construction Surveyor. Slope staking may be substituted for offset staking for channels with side slopes greater than 4 vertical feet or with 4:1 or steeper slopes, as agreed to by the Construction Surveyor.

A Land Surveyor registered in Kansas and employed or retained by the Construction Surveyor will conduct or supervise a diligent search for all Public Land Corner monuments, property and offset corner monuments which may be disturbed or destroyed by the construction. All monuments which are found will be witnessed and referenced for replacement.

All Public Land System Corner monuments, property and offset corner monuments which are disturbed or destroyed in the course of construction shall be reset by or under the supervision of a Land Surveyor registered in Kansas and employed or retained by the Construction Surveyor. Public Land System Corners shall be witnessed and reset in accordance with Kansas Statutes and Kansas State Board of Technical Professions Minimum Standards.

B. <u>Preservation of Monuments, Reference Points, and Stakes.</u> The Contractor shall protect and preserve the project's established reference points and benchmarks and shall make no changes or relocations to them without the prior approval of the Engineer. The Contractor shall be responsible for maintaining and protecting all baseline points, control points, reference points, bench marks, property and offset corners, Public Land System Survey Corners, and all other essential horizontal and vertical survey control points from physical disturbance until the project has been completed or until the survey points have been removed, witnessed or otherwise disposed of by the Construction Surveyor. In instances where any of the above said points may

be endangered, the Contractor shall give sufficient notice to the Construction Surveyor to enable said point or points to be reset or referenced before the beginning of the endangerment activity. The Contractor shall report to the Engineer any survey points lost or destroyed or if a survey point requires relocation because of necessary changes in grades or locations.

The Contractor shall be responsible for maintaining all survey staking and shall be charged for any survey points that must be re-set due to the Contractor's or sub-contractor's planned or negligent activities and for any and all reasons other than survey errors and omissions or project re-design. Charges will be at the established hourly rates of the Construction Surveyor and shall be deducted from the final payment.

The Contractor will be provided with a photocopy or fax of the construction field notes for their use in facilitation of location and re-marking stakes, if cut or fill stakes should become lost or destroyed.

C. <u>Coordination</u>. The Contractor (not sub-contractors) shall be responsible for requesting construction staking from the Construction Surveyor. The Contractor's request for stakes shall be a made at least 48 hours prior to the time staking is required. Said 48 hours does not include weekends or holidays. Priority of staking shall be based on the order in which calls for stakes are received except in instances where conflicts with utilities may arise.

D. <u>Meaning of Construction Stakes.</u> The Contractor shall satisfy himself as to the meaning of all stakes and marks prior to start of any construction activity based on those stakes. The Contractor is solely liable for the misinterpretation of stakes or for the use of stakes that are damaged due to any activity. Any questionable or suspect stake location, or cut or fill that may be due to Construction Surveyor error shall be reported to the Construction Surveyor immediately, prior to commencement of construction activities based on the suspect stake.

All survey construction stakes, horizontal and vertical control points shall follow the APWA Uniform Color Code as follows:

<u>White</u> - Proposed Excavation
<u><i>Pink</i></u> - Temporary Survey Markings
<u><i>Red</i></u> - Electric Power Lines, Cables, Conduit and Lighting Cables
<u>Yellow</u> - Gas, Oil, Steam, Petroleum or Gaseous Materials
Orange - Communication, Alarm or Signal Lines, Cables or Conduit
<u>Blue</u> - Potable Water
<u><i>Purple</i></u> - Reclaimed Water, Irrigation and Slurry Lines
<u>Green</u> - Sewers and Drain Lines

All survey property line and right-of-way stakes shall adhere to the following schedule:

- <u>*Red*</u> Right-of-way
- <u>Blue</u> Permanent Easements
- <u>Green</u> Temporary Easements

1.13 EXISTING UTILITIES.

A. <u>General</u>. The Contractor shall notify in writing responsible representatives of public utilities, railroads, or any other facilities or property that will be affected by their operations. Such notice shall be given not less than seven days before starting work in any area. The Contractor shall thereafter coordinate their work with the work necessary to protect or relocate such utilities, property or facilities, and cooperate to the fullest extent to avoid damage or service interruptions. For obtaining underground utility locations, the Contractor shall utilize the Kansas One Call service, telephone no. (811) or (800) 344-7233.

1.14 ACCESS.

Unless otherwise directed, the Contractor shall maintain traffic on roads affected. In no event shall more than 300 feet of roadway be left in such condition that it will not support vehicular traffic for access to residences or places of business unless alternative access is provided by the Contractor and approved by the Engineer.

1.15 FINAL INSPECTION.

When the Contractor believes that the project is ready for Final Inspection, they shall make the request for inspection, in writing, to the Engineer's Project Representative a minimum of 72 hours prior to the desired time for the final inspection. If the Project Representative agrees that the project is ready for final inspection, the Project Representative will coordinate with the Owner to establish the date and time of the Final Inspection. If the Project Representative determines that the Project is not ready for Final Inspection, the Contractor shall complete the remaining work or corrective actions identified by the Project Representative and then make a second written request for final inspection. The Project Representative will then coordinate with the Owner to establish a date and time for the Final Inspection.

END OF SECTION

SECTION 2

TRENCH AND STRUCTURE EXCAVATION, BACKFILL AND COMPACTION

2.01 GENERAL.

A. <u>Scope.</u> This section covers excavation, trenching, backfilling and grading incidental to the construction of sewers, pipelines and structures shown on the Drawings and described in these Specifications.

B. <u>Contractor's Responsibility</u>. The Contractor shall assume full responsibility for satisfactory performance of the work and for the safety of the work, working personnel and the general public.

Within permanent public right-of-way and easements and within the corporate limits of the City of Topeka, if the trench excavation encroaches upon a street, alley, or sidewalk that has bricks in any part of the pavement structure, including bricks overlain with asphalt, the requirements of Subsection 4.05 BRICK PAVEMENTS shall apply. If the trench excavation encroaches upon pavements not otherwise planned for replacement, the requirements of Subsection 4.06 – PAVEMENT REMOVAL AND REPLACEMENT FOR TRENCHES shall apply.

(1) <u>Permits.</u> All excavation within the City's right-of-way requires a permit from the Development Services Division prior to starting the excavation. No vehicle or machinery may be driven across any curb or sidewalk; or damage, break or cut any curb, gutter or sidewalk except as authorized under a permit. Curb and gutter shall not be bridged or filled with any material to gain access to private property thus obstructing the drainage of the gutter except by written permit.

Refer to Section 1 of these Standard Technical Specifications and Document 700 General Conditions of the Project Manual for further specifications of the Contractor's responsibilities.

2.02 EXCAVATION FOR TRENCHES AND STRUCTURES.

A. <u>General.</u> Unless specifically shown or designated otherwise, all excavation shall be by open cut.

B. <u>Structure Excavation</u>. Structure Excavation is excavation necessary to construct structures. Excavation for structures shall be to lines and grades shown on the Drawings. Extend the excavation for formed structures sufficiently to permit construction and inspection of forms, and for installation of drain tile or other below-grade work. Excavation shall be shored and braced to protect adjacent structures or installations from damage.

The excavation shall be maintained in a condition suitable for placing reinforcing steel and concrete by such dewatering of adjacent and underlying soil as may be required. Dewatering equipment and methods shall be approved by the Engineer. Approved dewatering equipment may be used within the structure provided that any openings in walls or floors shall subsequently be closed watertight, using methods and procedures approved in advance by the Engineer.

Before placing any concrete, excavation shall be inspected and approved by the Engineer.

(1) <u>Measurement and Payment</u>. Structure Excavation shall not be measured or paid for directly, but shall be subsidiary to the structure for which the excavation is performed.

No extra payment will be made for the excavation or removal of rock to provide for the construction of a structure unless "Rock Excavation for Structures" is listed as a pay item on the Bid Form. In which case, the provisions governing rock excavation as set forth in this section shall apply.

C. <u>Trench Excavation</u>. Trench Excavation is the excavation necessary to install sewers, culverts, waterlines, cables, conduit or other underground systems or ducts. Trench excavation shall be to the lines and grades indicated on the Drawings. Banks shall be vertical from bottom of the trench to at least 6 inches above the top of the pipe. Above that point, trench walls may be sloped as required for safety and shall conform to all pertinent OSHA Regulations. Trenches shall be excavated as near as is practical to the widths shown on the applicable Standard Detail sheets of the Drawings. The bottom of the trench shall be undisturbed soil smoothed to the satisfaction of the Engineer by backhoe bucket or hand shovel, or both, prior to placement of bedding material. Over-excavations shall be replaced with bedding material at no additional cost to the Owner. Trenches shall be maintained and dewatered as necessary to permit construction to be carried on in a satisfactory manner. Sheeting and bracing shall be provided in all trenches where required and shall conform to Subsection 2.03.

Trenches within the Corps of Engineers levee critical zone, generally those areas within 500 feet of the Kansas River levee, shall be constructed in compliance with the requirements of the Corps of Engineers.

(1) <u>Bid Item, Measurement and Payment.</u> Trench Excavation shall not be measured or paid for directly, but shall be subsidiary to the sewer, pipeline, or underground system for which the excavation is performed; or, incidental to the item "Trench Excavation and Backfill" when said item, as defined in Subsection 2.10, is included on the Bid Form.

No extra payment will be made for the excavation or removal of rock to construct trenches unless "Rock Excavation for Trenches" is listed as a pay item on the Bid Form. In which case, the provisions governing rock excavation as set forth in this Section shall apply.

D. Rock Excavation for Structures and Trenches.

(1) Rock Excavation for Structures and Trenches is specified in Subsection 3.06.

2.03 SHEETING AND BRACING.

A. <u>Construction Requirements.</u> Sheeting and bracing shall be provided in all trenches where required and shall conform to all pertinent OSHA Regulations. Sheeting may be wood or metal. Wherever, because of unstable trench conditions, it is necessary to drive sheeting below the springline of the pipe, it shall be driven to a depth of 2 feet (minimum) below the flowline of the pipe. After the trench has been backfilled up to a level 1 foot above the pipe, sheeting may be removed and the space left because of such removal shall be filled immediately and the backfill recompacted. Wood sheeting which has been driven to below the springline of the pipe shall be left in place below a level of 1 foot above the top of the pipe.

Trench boxes or shields may be used instead of sheeting and bracing. Excavations shall be braced to prevent subsidence or injury to the adjoining premises. The Contractor shall be liable for all damages arising by reason of neglect or carelessness.

B. <u>Measurement and Payment.</u> Sheeting and bracing shall not be measured or paid for directly but shall be subsidiary to the item for which the sheeting and bracing is required.

2.04 CONTROL OF GROUND WATER AND SURFACE WATER.

A. <u>Construction Requirements.</u> Where ground water or surface water is encountered, trenches shall be dewatered as necessary to permit the construction to be carried on in a satisfactory manner. All waters discharged from the Contractor's dewatering activities shall be appropriately treated to prevent erosion and water pollution. Portions of sewers where all joints have been completed may be used for draining trenches, provided such drainage is free from debris. Drainage may be collected in temporary sumps and then pumped into natural drainage channels as approved by the Engineer. Surface water shall be prevented from entering trenches.

Where approved by the Engineer, and approved in writing by the property owner, existing drainage channels may be temporarily diverted. After completion of the construction, the temporary channels and original channels shall be returned to their original condition unless otherwise approved by the property owner and Engineer. It shall be the Contractor's responsibility to obtain the permission of the property owner, in writing, for the temporary channels.

The Contractor shall at all times maintain appropriate erosion and water pollution control measures as specified in Section 4, Obstructions and Incidental Construction.

B. <u>Measurement and Payment.</u> Control of ground and surface water shall not be measured or paid for directly but shall be subsidiary to other items of the Contract.

2.05 STABILIZING TRENCH BOTTOMS.

A. <u>Construction Requirements.</u> Wet or unstable trench bottoms shall be stabilized by excavating to additional depth as directed by the Engineer and replacing the unsatisfactory soil with crushed material.

B. <u>Materials.</u> Material for stabilizing trench bottoms shall be crushed limestone or recycled concrete with angular shapes for high interlocking capability meeting one of the following gradations as approved by the Engineer:

- 1) 4 inch to 8 inch primary crusher run.
- 2) 3 inch to 4 inch crusher run.
- 3) $1 \frac{1}{2}$ inch poorly graded.
- 4) 3/4 inch poorly graded.
- 5) Recycled concrete material with gradation approved by the Engineer.
- 6) Bedding material as specified in Subsection 2.08.

Field conditions shall be the determining factor for individual or combined use of these materials. The upper 2 inches of any stabilized area shall consist of bedding material as specified in Subsection 2.08. In sewer trenches, the minimum depth of bedding material shall be 4 inches under the pipe.

C. Bid Item, Measurement, and Payment.

(1) <u>Bid Item:</u>

CRUSHED MATERIAL FOR STABILIZING TRENCH BOTTOMS Unit: Ton (nearest 0.1 Ton)

(2) <u>Measurement.</u> Crushed Material for Stabilizing Trench Bottoms shall be measured by the ton in place, as determined by load tickets provided to the Engineer. Measurement shall be to the nearest 0.1 ton.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per ton for "Crushed Material for Stabilizing Trench Bottom", which price shall be full compensation for all excavation, furnishing, hauling, placing, and maintaining the materials as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

2.06 STABILIZING STRUCTURE SUBGRADE.

A. <u>Construction Requirements.</u> Except for reinforced concrete box (RCB) structures, the normal foundation under structures will be undisturbed soil. Wet or unstable structure subgrade shall be stabilized by excavating to additional depth as directed by the Engineer and bringing the subgrade back to grade using approved material from excavation or borrow sources, uniformly compacted as specified for "Type A" compaction. Alternatives to the above corrective method are:

- 1. Using the bedding material specified in Subsection 2.08.
- 2. Increasing the thickness of the concrete base.

If over-excavation occurs through the actions of the Contractor and not at the request of the Engineer, the subgrade shall be brought back to grade, prior to placing, by similar means, but at the sole expense of the Contractor.

B. Bid Item, Measurement, and Payment.

(1) Bid Item:

STABILIZING STRUCTURE SUBGRADE Unit: Cubic Yard (nearest 1 C.Y.)

(2) <u>Measurement.</u> "Stabilizing Structure Subgrade" shall be measured by the Cubic Yard of subgrade replaced, except that no measurement will be made for the volume bounded by vertical planes 18 inches outside the base of the structure. Dimensions of the excavated volume shall be measured to the nearest 0.1 foot and individual volumes computed in cubic feet, summed, converted to cubic yards, and rounded to the nearest cubic yard.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per cubic yard for "Stabilizing Structure Subgrade", which price shall be full compensation for all excavation of wet or unstable structure subgrade material, excavating replacement subgrade material, furnishing, hauling, placing, and maintaining the materials as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

2.07 SUBGRADE FOR CAST IN PLACE AND PRECAST REINFORCED CONCRETE BOX (RCB) STRUCTURES.

A. Subgrade for Cast In Place RCB Structures.

(1) <u>Concrete Seal Course.</u> All cast in place RCB structures shall be constructed on a 3 inch minimum thickness concrete seal course. The seal course concrete shall be Commercial Grade as defined in Section 5, Concrete, and have a minimum compressive strength of 2,500 psi. The seal course under RCB structures shall not be paid for directly but shall be included in the price bid for Reinforced Concrete Box (RCB) Structures.

(2) <u>RCB Subgrade Stabilization.</u> When the subgrade for a cast in place RCB is not capable of supporting the weight of a person without undue deformation, a stabilized stone base of a width and depth determined by the Engineer shall be installed under the concrete seal course. Stabilized stone base shall consist of crushed limestone or recycled concrete with angular shapes for high interlocking capability. Stone gradation shall be one of the gradations listed in Subsection 2.05 B, as approved by the Engineer. Field conditions shall be the determining factor for individual or combined use of these materials.

B. <u>Subgrade for Precast RCB Structures.</u> All precast RCB structures shall be constructed on either a six inch (minimum) thickness of crushed stone, or a three inch (minimum) thickness of concrete seal course. Crushed Stone shall meet the requirements for bedding material specified in Subsection 2.08 B. The seal course concrete shall be Commercial Grade as defined in Section 5, Concrete, and have a minimum compressive strength of 2,500 psi. The crushed stone or concrete seal course stabilization under Precast RCB Structures shall not be paid for directly but shall be included in the price bid for Reinforced Concrete Box (RCB) Structures. When additional stabilization is required below the six inches of crushed stone or three inches of concrete seal course for Precast RCB Structures, the stabilization shall follow Subsection 2.07 A(2) above.

C. Bid Item, Measurement, and Payment.

(1) <u>Bid Item:</u>

STABILIZED STONE BASE FOR RCB (SET PRICE)

Unit: Ton (nearest 0.1 Ton)

(2) <u>Measurement.</u> "Stabilized Stone Base For RCB" shall be measured by the ton in place, as determined by load tickets provided to the Engineer. Measurement shall be to the nearest 0.1 ton.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the set Contract unit price per ton for "Stabilized Stone Base For RCB", which payment shall be full compensation for all excavation of wet or unstable structure subgrade material, excavating replacement subgrade material, furnishing, hauling, placing, and maintaining the materials as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

2.08 BEDDING MATERIAL AND PLACEMENT.

A. <u>Construction Requirements.</u> Storm and sanitary sewer trenches shall be excavated to a depth not less than 4 inches below the bottom of the pipe and the pipe shall be laid on bedding material. Bedding material shall be placed and compacted uniformly by bucket tamping or other suitable method to the limits described in Subsection 2.10 and as shown on the Standard Drawings for Sanitary and Storm Sewers. Bedding material and placement for waterlines is specified in Section 8, Watermains, Fire Lines and Water Service Laterals.

Bedding material shall not be used in the Kansas River Valley where the native material is primarily sand or silt.

Work within a Corps of Engineers "Critical Zone" must comply with the Corps of Engineer's requirements.

B. <u>Materials.</u> Bedding material shall be crushed limestone having the following characteristics:

Retained on ³ / ₄ inch sieve	0%
Retained on ¹ / ₂ inch sieve	15% to 35%
Retained on 3/8 inch sieve	40% to 70%
Retained on No. 4 sieve	90% to 100%
Deleterious Substances, maximum	5%

C. <u>Measurement and Payment</u>. Bedding material and its placement shall not be measured or paid for directly, but shall be subsidiary to the storm or sewer sanitary sewer being constructed.

2.09 COMPACTION.

A. Types of Compaction Defined.

(1) <u>Type A Compaction</u>. Compacted density of the material shall be at least 95% of the maximum density determined in accordance with AASHTO T-99. The moisture content of the material at the time of compaction shall be uniform and shall not be more than three percentage points above or below the optimum moisture content of the soil involved. If the soil is unstable at this moisture range, the moisture may be varied to the point at which it is stable as determined by the Engineer. The maximum lift thickness of loose material to be compacted is 6 inches.

(2) <u>Type AB Compaction</u>. Compacted density of the material shall be at least 90% of the maximum density determined in accordance with AASHTO T-99. The moisture content of the material at the time of compaction shall be uniform and shall not be more than three percentage points above or below the optimum moisture content of the soil involved. The maximum lift thickness of loose material is 6 inches.

(3) <u>Type B Compaction</u>. Compacted density of the material shall be equal to or greater than that of the undisturbed adjacent material. The moisture content of the soil at the time of compaction shall be uniform and shall be such that the soil can be compacted to the required density. The maximum lift thickness of loose material is 10 inches.

B. Applications.

(1) <u>Type A Compaction.</u> Unless otherwise indicated in the Contract documents or geotechnical report, Type A Compaction shall be used under all paved areas, except sidewalks, which lie within the dedicated right-of-way of all public thoroughfares. Type A Compaction shall also be used where sewers intersect stream beds and at other locations designated on the Project Drawings, around structures, and to a level not less than 1 foot above the top of sewer pipes, as specified elsewhere in this section.

(2) <u>Type AB Compaction</u>. Unless otherwise indicated in the Contract Documents or geotechnical report, Type AB Compaction shall be used for all embankment, fill, and / or backfill within the dedicated right-of-way of all public thoroughfares, except areas heretofore specified for Type A Compaction.

(3) <u>Type B Compaction</u>. Unless otherwise indicated in the Contract Documents or geotechnical report, Type B Compaction shall be used for all embankments, fill, behind RCB wingwalls, and / or backfill not heretofore specified for Type A or Type AB Compaction.

C. <u>Construction Requirements.</u> Prior to proceeding with the compaction of materials requiring Type A or Type AB Compaction, a Standard Proctor Curve as determined by AASHTO T 99 (ASTM D 698) shall be obtained for each type of material to receive such compactive effort. Proctor curves shall be obtained from soil samples selected by a certified testing laboratory from materials excavated by the Contractor. All costs associated with the selection of soil samples and performing the necessary tests to obtain the Proctor curves shall be paid by the Contractor.

D. <u>Recommendations for Compaction Equipment.</u> Most manufacturers of compaction equipment provide information for the use of their equipment.

For compaction of cohesive soils such as clay or clay-silt mixes, the recommended equipment includes rammers which shear and knead the soil and sheepsfoot rollers, either towed or backhoe mounted static types or self-propelled static or vibratory, which shear, blend and bond the soil.

The thickness of the soil layer being compacted should not exceed the capabilities of the compacting force of the equipment being used. Proper thickness allows full and uniform densification of each layer and is directly proportional to the number of passes required to achieve the desired result.

Steel wheeled smooth rollers, either static or vibratory or vibratory smooth plates are not normally recommended for use on cohesive soils but are highly recommended for consolidating granular soils.

When compacting a mixture of cohesive and granular soils, equipment designed for the predominant soil type should be used.

E. <u>Basis for Acceptance for Compaction.</u> Normally the nuclear densometer test shall be the basis for acceptance of compaction. However, when materials consist of a mixture of different soil types or contain a substantial amount of rock chips, the nuclear densometer may give erroneous results. Therefore, the test results may be tempered by the judgment of the Engineer's representative after observing the compaction effort. The decision to accept or reject compaction may be influenced by the thickness of lift, type of compaction equipment, number of passes of

compaction equipment, depth of penetration of a steel probe into the compacted material or successful proof rolling with a tandem axle dump truck loaded to a minimum weight of 25 tons.

F. <u>Measurement and Payment</u>. Compaction shall not be measured or paid for directly, but shall be subsidiary to other items of the Contract.

2.10 BACKFILL.

A. <u>General.</u> All trenches and excavations for structures shall be backfilled to the lines and grades shown in the project drawings and as specified herein. Where required, bedding material as specified in Subsection 2.08 and as follows, shall be placed, compacted, and approved by the Engineer prior to the placement of backfill.

B. <u>Materials.</u> Backfill material shall be approved excavated material selected from the site or approved supplementary borrow material. Material shall be unfrozen, free of debris, organic material, and rocks or clods larger than three inches in any dimension.

C. <u>Unsuitable Backfill Material</u>. No material shall be used for structure backfill or trench backfill that contains rocks or clods larger than three inches in any dimension, frozen material, debris, junk, or organic material. Such material shall be removed from the backfill material and disposed of as directed by the Engineer. Removal and disposal of unsuitable material is subsidiary to other bid items.

Sand backfill will not be allowed except in areas adjacent to the Kansas River where sand is the existing natural material

D. <u>Construction Requirements.</u> Backfill material shall be deposited in loose layers not more than 6 inches thick, and compacted to the requirements specified below. Backfill procedures should be completed parallel to the trench whenever possible. Jetting or other hydraulic methods intended to compact the backfill are prohibited. Trenches shall be dewatered as much as practical prior to the placement of bedding material and backfill.

(1) <u>Backfill Around Structures.</u> Backfill around structures with approved material after completion of below grade construction and removal and cleanup of all forms, lumber and trash. Backfilling against any structure shall proceed only upon approval of the Engineer and shall be based on concrete attaining 75% of design strength. Each layer shall be placed and compacted as specified for Type A Compaction and shall include emphasis on the area adjacent to the structure walls

Backfill of retaining walls shall proceed simultaneously on the front and back of the wall with care taken to prevent forward tipping and undue bending stress in the wall at its foundation.

(2) <u>Trench Backfill</u>. Backfill trenches only after pipelines, joints, wyes and bedding have been inspected and approved. Backfill with approved material from excavation or supplementary borrow areas, free from rocks or clods larger than 3 inches in any dimension

i) <u>Initial Backfill for Pipes with Pipe Stiffness (PS) of 100 or less.</u> This category includes PVC pipe meeting the requirements of ASTM D 3034 SDR **26** and ASTM F 679 PS 46. Initial backfill shall consist of specified bedding material to

a point 6 inches above the top of the pipe. Care shall be taken to insure that bedding material is worked in around the haunches of the pipe. Bedding material shall be compacted as specified for Type A compaction.

ii) <u>Initial Backfill for Pipes with Pipe Stiffness (PS) over 100.</u> This category includes PVC pipe meeting the requirements of ASTM D 2665 (Schedule 40), ductile iron pipe, vitrified clay pipe, reinforced concrete pipe and corrugated steel pipe. The initial backfill shall consist of specified bedding material to the top of the pipe. Care shall be taken to insure that bedding material is worked in around the haunches of the pipe. Bedding material shall be compacted as specified for Type A Compaction.

iii) <u>Backfill from Springline to One Foot Over Top of Pipe.</u> This applies to all types of pipe regardless of where the top of bedding material is located. Selected backfill material shall be placed to the full width of the trench in loose layers not to exceed 6 inches thick. Each layer shall be compacted as specified for Type A Compaction. Continue to place and compact subsequent layers until the pipe is covered to a depth of at least one foot. All material to this depth shall be compacted as specified for Type A compacted as specified for Type A compacted as specified for Type A compacted.

iv) <u>Backfill for the Remainder of the Trench.</u> After selected backfill and compaction to 1 foot above the top of pipe, the remaining backfill shall be composed of selected excavated materials free from clods or rocks greater than 3 inches any dimension, frozen materials, debris or junk; or of approved supplementary borrow material. Backfill material shall be deposited and compacted as detailed in the Project drawings and Subsection 2.09 B, above.

E. <u>Basis of Acceptance</u>. Prior to proceeding with the backfill, the Contractor shall provide for the collection and testing of soil samples as specified in Subsection 2.09 C.

During backfill operations, soil density tests shall be taken by the Engineer or their representative. When results indicate that compaction does not meet the requirements of these Specifications, the backfill material shall be removed and replaced or re-compacted as necessary to meet the specified requirements at no additional expense to the Owner. Additional tests shall be performed on re-compacted areas to assure compliance with the requirements.

If the Contactor elects to backfill with material for which no Standard Proctor Curve has been completed, the backfill shall still be tested by nuclear densometer and the readings saved for later comparison with the Proctor Curve. If this comparison indicates that Contractor had failed to achieve the required compaction, the backfill shall be removed and re-compacted at no additional expense to the Owner.

F. Bid Item, Measurement and Payment.

(1) <u>Backfill for Structures</u>. Backfilling of excavations necessary for the construction of structures shall not be paid for directly but shall be subsidiary to the respective structure.

(2) <u>Backfill for Trenches.</u> Backfilling of trenches shall not be paid for directly but shall be subsidiary to the sewer, pipeline, cable, conduit, or other underground system for which the excavation was performed; or, incidental to the item "Trench Excavation and Backfill" when said item is included on the Bid Form.

(3) <u>Bid Item</u>. The bid item "Trench Excavation and Backfill" shall include the excavation of trenches as specified in Subsections 2.02, 2.03, 2.04, and 2.05. The stated bid item also includes providing and placing bedding material, backfill and compaction as specified in this Subsection and Subsection 2.08.

TRENCH EXCAVATION AND BACKFILL; (*)' to (*)', Type (#) Compaction Unit: Linear Foot (nearest 1 L.F.)

(*) Depth range of trench.

(#) A, AB, or B.

(4) <u>Measurement</u>. "Trench Excavation and Backfill" will be measured by the linear foot, to the nearest foot, from center to center of manholes, for each combination of depth range and compaction category used in backfilling the trench. Depths of trench excavation will be considered to be from the surface of the original ground or pavement to the invert grade of the pipeline. The initial increment of depth will be 0 foot to 6 foot. Each succeeding depth increment will be 2 feet.

(5) <u>Payment.</u> Payment for "Trench Excavation and Backfill" shall be made at the Contract unit price per linear foot for each combination of depth range and compaction category of trench completed and accepted, which price shall be full compensation all control of ground water, sheeting and bracing, bedding material, saw-cutting, excavation, trimming, disposal of surplus materials, hauling, compaction, materials testing, and the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

2.11 SUPPLEMENTARY BORROW MATERIAL FOR TRENCHES.

A. <u>General.</u> Supplementary borrow material for backfilling trenches shall be provided by the Contractor if excavations within the project limits yield insufficient suitable material to properly backfill the trench following placement of the pipe and bedding material. The Contractor shall notify the Engineer of their intent to import material 24 hours in advance of hauling any supplemental borrow material to the project.

Supplementary material shall be provided, placed, measured and paid for as specified in Subsection 3.08.

2.12 TUNNELING AND BORING.

A. <u>General</u>. This section applies to the installation of pipes, box structures, and conduits by jacking, boring or tunneling. The installation of encasement pipes by boring, jacking or tunneling is specified in Section 4. If the pipe is bored, jacked or tunneled under a highway, railroad, street, structure, or vegetation, the installation of the pipe must not interfere with the highway, railroad, street, structure, or vegetation. Structures and roadbeds shall not be weakened by the installation of the pipe, box structure or conduit. **There shall be no heave or settlement at the surface above the installation**. The Contractor shall submit to the Engineer for approval a detailed plan for the proposed method of installing the pipe. **The maximum size of a boring head shall be 1.5 times the pipe or conduit size. If there is a 1" or more void between the wall of the bore and the outside of the pipe or conduit, the void must be pressure grouted full. The minimum boring depth is 36 inches.** At the Contractors option and when approved by the Engineer, the Contractor may substitute jacking, boring or tunneling for open trench excavation. Payment for optional

jacking, boring or tunneling will be at the established Unit Price for the installation method for which the substitution was made.

B. <u>Materials.</u> Pipes, box structures and conduits to be installed by jacking, boring or tunneling methods shall be as specified in the Project Documents and shall meet the applicable requirements of Sections 5, 6 and 8. Where segmented tunnel liner system is used, it shall be designed and stamped by a Kansas Professional Engineer. The minimum factors of safety shall be as follows:

CRITICAL ELEMENT	FACTOR OF SAFETY
Seam Strength	3.0
Wall Buckling	2.0
Installation Stiffness	3.0

C. <u>Construction Methods</u>. Pipes, box structures or conduits shall not be installed directly by boring or jacking methods unless such installation is specified or specifically permitted in the Project Documents or approved by the Engineer. Install pipes or box structures starting at the lower elevation and ending at the higher elevation The bore or tunneling pits and trenches necessary to install the pipe shall comply with OSHA requirements. The Contractor shall backfill and compact such pits and trenches upon completion of the pipe installation to the requirements set forth in this Section 2. Installation of the pipe or box shall begin at the lower elevation (downstream) and progress to the higher elevation. The final position of the pipe or box shall not vary from the specified line or grade more than 1 inch in 10 feet. Variations, if any, shall be regular and in one direction. The flowline shall be in the specified direction. The Contractor shall repair or replace, as determined by the Engineer, all pipes, box structures or conduits damaged or misaligned during the boring, jacking or tunneling operations.

(1) Jacking. The Contractor shall use heavy duty jacks suitable for the intended purpose and use a jacking head and bracing between the jacks and the jacking head, to apply uniform pressure around the ring of pipe. The Engineer will allow the use of joint cushioning material. The Contractor shall use a jacking frame or backstop and guides that support and direct the pipe in the proper line and grade. As the pipe is jacked, the Contractor shall excavate the material just ahead of the pipe (maximum of 2 feet in advance) and remove the excavated material through the pipe. Excavation for the underside of the pipe for a minimum of 1/3 of the circumference of the pipe shall follow the contour and grade of the pipe. Over-excavation (maximum of 2 inches) for the upper half of the pipe is allowed. The over-excavation shall taper to nothing at the point the excavation conforms to the contour of the pipe. The Contractor shall fill over-excavation in excess of 1 inch with an approved material (flowable fill, sand or slurry grout) the length of the installation after the pipe is installed. The Engineer may allow the use of the cutting head of steel plate around the head end of the pipe. The cutting edge may extend a short distance beyond the end of the pipe. Construct (with inside angles or lugs) the cutting edge to prevent it from slipping back into the pipe. When the pipe jacking operations begin, to the extent possible, continue the operations without interruptions to prevent the pipe from becoming firmly set in the excavation.

(2) <u>Tunneling</u>. The Contractor shall use a tunnel lining of sufficient strength to support the overburden. Fill the space between the tunnel lining and the limits of the excavation with slurry grout. Provide access holes in the tunnel lining (maximum spacing of 10 feet) for the grouting operations.

D. Bid Item, Measurement and Payment.

(1) <u>Bid item:</u>

(*) (Bored, Jacked or Tunneled) Unit: Lineal Ft. (Nearest 1ft.)

(*) – Type and size of pipe, box structure, or conduit.

(2) <u>Measurement.</u> "(*) (Bored, Jacked or Tunneled)" shall be measured to the nearest foot along the centerline of the pipe from end to end of the bore holes or tunnel.

(3) <u>Payment.</u> Payment for the various types and sizes of pipes, box structure and conduit installed by jacking, boring, or tunneling shall be made at the respective established Unit Prices. Payment for optional jacking, boring or tunneling will be at the established Unit Price for the installation method for which the substitution was made. Such payments shall be full compensation for all labor, materials, equipment and incidentals necessary to complete the work as specified.

2.13 BLASTING.

A. <u>General.</u> Blasting is prohibited unless specifically permitted by the Drawings, Supplementary Conditions, City Engineer or County Public Works Director. The Contractor is required to secure a blasting permit in accordance with applicable provision of the Code of the City of Topeka. Compliance with these procedures does not relieve the Contractor of responsibility for damage to life or property.

B. <u>Construction Requirements.</u> Blasting shall be done only by persons experienced in the handling of explosives.

In locations where flying rock would constitute a hazard to persons or property, blast charges shall be of limited size. Before detonation, the trench shall be backfilled or covered with woven metal protective mats or other mats if approved by the Engineer.

(1) <u>Vibration Monitoring Requirements.</u> The Contractor shall be responsible for seismographic monitoring of the vibration due to blasting at foundations adjacent to or nearest the point of removal. The engineering seismograph shall be a Dallas Instrument Company Model ST-4 or approved equal and shall be operated by qualified personnel.

Foundations shall include garage, shed, house and pool slab footings and foundation walls.

Monitoring measurements shall be taken within three (3') feet of the nearest adjacent structure foundation at the nearest point to blasting. The transducer will be buried six inches (6'') to one foot (1') below the surface.

If vibration exceeds the allowable maximum limits, the Contractor shall use an alternate method for removal of the rock, provided it complies with the vibration requirements herein.

C. <u>Measurement and Payment.</u> Blasting, monitoring vibrations, and all associated hauling, equipment, labor, materials, and incidentals shall not be measured or paid for directly, but shall be subsidiary to other items of the Contract.

END OF SECTION

SECTION 3

EARTHWORK AND GRADING

3.01 GENERAL.

A. <u>Scope.</u> This section covers excavation and grading incidental to the construction of sidewalks, alleys, roadways, channels, berms, parking lots and other earthen structures or facilities requiring the manipulation, cutting, grading, transporting, placing and compaction of soil.

B. <u>Contractor's Responsibility.</u> The Contractor shall assume full responsibility for satisfactory performance of the work and for the safety of the work, working personnel and the general public. Refer to Section 1 of these Standard Technical Specifications and Document 700 General Conditions of the Project Manual for further specifications of the Contractor's responsibilities.

C. <u>Erosion and Water Pollution Control</u>. The Contractor shall at all times maintain appropriate erosion and water pollution control as specified in Section 4, Obstructions and Incidental Construction.

3.02 STRIPPING.

A. <u>Construction Requirements.</u> All areas to receive embankment shall be stripped of existing organic and other undesirable material to a minimum depth of 6 inches. This material shall be disposed of in a manner approved by the Engineer.

B. <u>Measurement and Payment.</u> Stripping shall not be measured or paid for directly but shall be subsidiary to other items of the Contract.

3.03 TOPSOIL.

A. <u>Construction Requirements.</u> Topsoil shall be removed from the area within the construction limits and stockpiled separately for use in finish grading as specified in Sections 4.14 and 4.15. Stockpiles shall be prevented from generating water pollution as specified in Subsection 4.15

B. <u>Materials.</u> Topsoil is defined as the top 6 inches of loam that contains a good supply of humus and a high degree of fertility.

C. <u>Measurement and Payment.</u> Topsoil removal, stockpiling and replacement shall not be measured or paid for directly but shall be subsidiary to other items of the Contract.

3.04 CLASSIFICATION OF EXCAVATION.

A. <u>General.</u> The geological and soil information shown in the Contract Documents is based on studies made in the field, and represents the best information available at the time of design. With the exception of the site specific recommendations for treatment and preparation of subgrades as may be contained in a Geotechnical Report, any physical data in regard to subsoil, rock, water table

or other site conditions, which are noted on the Drawings or Reports or referred to herein, represent conditions as of the date of their determination and are for information only. Any reliance by the Contractor on such data will be at the Contractor's risk.

B. <u>Excavation Classifications</u>. Any excavation for the Project will be included in the following classifications of:

Structure Excavation – See Subsection 2.02 B.

Trench Excavation – See Subsection 2.02 C.

Unclassified Excavation – See Subsection 3.05.

Rock Excavation – See Subsection 3.06.

Pavement Removal – See Subsection 3.07.

These classifications shall include all materials encountered in the scope of the work. As the work is performed, the Engineer has the authority to identify and define the various classifications of excavation encountered.

3.05 UNCLASSIFIED EXCAVATION.

A. <u>Definition</u>. "Unclassified Excavation" consists of the excavation of any and all materials not otherwise classified encountered during the course of the work.

If rock is encountered during excavation, it shall be considered "Unclassified Excavation" unless "Rock Excavation" is included as a pay item in the Project Documents.

B. <u>Construction Requirements.</u> Before beginning the excavation, have all necessary traffic and pedestrian control in place, have the location of underground utilities and pipelines marked, clear and grub all vegetation, strip areas to receive embankment, and remove existing structures. Obtain all permits and clearances required and not provided by the Owner before starting work.

If the Contractor's excavation operations expose potentially historical or archaeological significant sites, any potentially hazardous materials, or utilities or pipelines in conflict with the excavation, discontinue the excavation of such sites until the Engineer determines the disposition of the discovery.

Obtain the Engineer's approval before wasting or disposing of surplus excavated material. If approved by the Engineer, use approved surplus excavated material to widen embankments, flatten slopes or as directed by the Engineer. Review flood plain information and environmental permitting for the project prior to wasting material on the project. If surplus excavation material is wasted on the project, place the material to provide a neat appearance. Do not place waste materials in a manner that is detrimental to the abutting property. Disposal of surplus excavated material shall be completed as specified in Subsection 3.13.

When embankment or subgrade materials are unstable due to naturally occurring wet or saturated conditions, including conditions caused by groundwater, rain, and standing surface water, the

Contractor shall aerate the material and, if necessary, remove the material for drying until the moisture content is acceptable. After the material has been dried to a workable condition, the Contractor shall incorporate the material into the embankment or subgrade. The Contractor shall excavate and dry such material at no additional cost to the Owner. The Contractor may use other means of drying the subgrade, such as adding fly ash or calcium chloride, as approved by the Engineer. The cost of drying subgrade by any approved method is incidental to Unclassified Excavation.

C. <u>Unsuitable Material.</u> Depending on the makeup and characteristics of the unclassified excavation, some material may not be suitable for use in embankment or subgrade. The Engineer will identify which material may not be used for embankment or subgrade. If excavated material is encountered that in the opinion of the Engineer is not suitable for construction of embankments or subgrades, the Engineer may request the Contractor to dispose of the material in the manner specified in Subsection 3.13.

Material that is unstable due to naturally occurring wet or saturated conditions, including conditions caused by groundwater, rain, and standing surface water, but otherwise workable after drying, as determined by the Engineer, is suitable material. Such material shall be aerated as specified in Paragraph b above at no additional cost to the Owner.

Unsuitable materials include any junk, trash debris, organic materials; soils with a high organic content such as peat or A - Horizon soils; or soils with a plastic limit lower than the optimum moisture content of the soil and cannot be compacted at optimum density.

(1) <u>Over Excavation for Removal of Unsuitable Subgrade Materials.</u> When the Engineer determines a material encountered in a cut subgrade below final plan elevation is unsuitable, the Contractor shall excavate the material to limits established by the Engineer and backfill with appropriate material as approved by the Engineer. The Contractor shall allow the Engineer sufficient time to measure the excavated area before backfilling.

If in the opinion of the Engineer, the volume of over excavation required to remove unsuitable material in subgrade areas is excessive, alternative means of establishing a suitable subgrade foundation shall be explored. These alternatives shall be evaluated on a case by case basis, but may include installation of geogrids; modification of the material by the addition of calcium chloride, fly ash, or lime; or construction of an aggregate subbase. If the means of establishing a suitable subgrade foundation is not included as a pay item in the Project Documents, the Contractor shall submit a price for the work to the Engineer for consideration by the Engineer and Owner. Once the price is established, a Change Order shall be written and approved prior to the Contractor proceeding with the work.

D. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

UNCLASSIFIED EXCAVATION

Unit: Cubic Yard (nearest C.Y.)

(2) <u>Measurement.</u> The completed and accepted percentage of plan quantity for "Unclassified Excavation" shall be considered the measured quantity unless the Contractor requests, and it is agreed upon in writing before the start of the project, that 1) another method of quantity determination will be followed or 2) the plan quantity is questionable and further quantity determination is needed. If another method of quantity determination is followed, all pay requests must accurately reflect the quantities to date. No payment for back quantities will be allowed. If rock is encountered, it shall not be measured separately unless the pay item "Rock Excavation" is included in the Project Documents.

If over excavation is completed to remove unsuitable material, or for any other reason, and such over excavation was requested or approved by the Engineer, measurement of the volume of over excavation will be made by the average end area method. Trapezoidal end areas and the distance between end areas shall be measured to the nearest 0.1 foot as can be reasonably accomplished with a 100 foot cloth tape and level. The volume in cubic feet thus computed shall then be converted to cubic yards and rounded to the nearest cubic yard. The measured volume of this computed quantity will be added to the completed and accepted quantity of "Unclassified Excavation".

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per cubic yard for "Unclassified Excavation", which payment shall be full compensation for all excavation, hauling, grading, stockpiling, trimming, wasting, disposal, and drying the materials as specified; and for all equipment, tools, labor, and incidentals necessary to complete the work.

3.06 ROCK EXCAVATION.

A. <u>Rock.</u> Rock is defined as all sedimentary, igneous and metamorphic rock which is naturally in place and is firm, rigid and un-weathered. Rock also includes boulders or other detached stone with a volume of 2 cubic yards or more.

If rock is encountered during excavation, it shall be considered "Unclassified Excavation" unless "Rock Excavation" is included as a pay item in the Project Documents.

B. <u>Construction Requirements.</u> Rock encountered during excavation shall be removed to allow the construction of the Project to the lines and grades shown in the Contract Documents. Over breakage and backfill over breakage shall not be measured or paid for except for that required in the top 1 foot of the subgrade. Rock encountered in cut subgrades shall be removed to a depth of 1 foot below the top of the subgrade and fill material placed and compacted as provided herein. The Contractor shall waste or dispose of the excavated rock material in the manner specified in Subsection 3.13. Where fill or embankment heights are greater than four feet above the existing ground, and only when approved by the engineer, the Contractor may incorporate rock excavated from the project into the embankment as specified in Subsection 3.09.

- C. Bid Item, Measurement and Payment.
 - (1) <u>Bid Item:</u>

ROCK EXCAVATION

Unit: Cubic Yard (nearest 1 C.Y.)

(2) <u>Measurement.</u> Unless "Rock Excavation" is included as a pay item in the Contract Documents, the excavation of rock will be measured as "Unclassified Excavation."

When "Rock Excavations" is included as a pay item in the Contract Documents, measurement will be of volume of rock actually removed. Rock encountered in two or more ledges with interlaying strata of soil, clay, gravel or shale not more than 12 inches in thickness between each ledge will be classified as solid rock from the top of the top ledge to the bottom of the bottom ledge of rock. Plan quantity for Rock Excavation is estimated and shall not be used as measured quantity.

When included as a pay item in the Contract Documents, the volume of Rock Excavation shall be computed using the average end area method with dimensions measured to the nearest 0.1 foot and individual volumes computed in cubic feet, summed, and converted to cubic yards. The Engineer shall determine the location of and interval between the end areas measured. The Contractor shall coordinate with the Engineer to allow sufficient time to measure the volume of rock excavated and shall assist the Engineer in making measurements of the volume of rock excavated upon the Engineer's request.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit prices per cubic yard for "Rock Excavation" when shown as a pay item in the Contract Documents, which payment shall be full compensation for all excavation, trimming, disposal of surplus materials; and the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

3.07 PAVEMENT REMOVAL.

A. <u>Pavement Defined.</u> For the purpose of removal work, "pavement" shall include any thickness of Portland cement concrete pavement, Portland cement base course, concrete curb and gutter, concrete sidewalk, bituminous mix material over six inches in thickness, and all bituminous mix material laid upon these materials.

B. <u>Protection</u>. Should the Contractor's construction equipment damage any pavement surface, whether new or existing, the Contractor shall be responsible for the repair and / or replacement of the damaged pavement surface, at their expense, as directed by the Engineer.

C. <u>Construction Requirements.</u> Before beginning the pavement removal, have all necessary traffic and pedestrian control in place. Have the location of underground utilities and pipelines marked. Verify the depth of underground utilities and use caution when removing pavement over utilities to avoid damage thereto. Check the area for drainage structures or other structures which could be damaged by the pavement removal process. Prevent adjacent structures from being damaged by vibration. Obtain all permits and clearances required and not provided by the Owner.

The Contractor shall remove pavement to the limits shown on the plans. Where pavement to be removed abuts pavement to remain, before the pavement is removed, the line separating the two areas shall be saw-cut to the full depth of the pavement. For concrete pavement, entire concrete panels must be removed unless otherwise directed by the Engineer.

Where paved areas of streets, alleys, parking lots, or driveways, are being trenched through and not otherwise planned for replacement with the Project, the existing pavement shall be removed to the limits required to permit safe trench excavation as specified in Section 2, Trench and Structure Excavation, Backfill and Compaction. For concrete pavement, entire concrete panels must be removed and replaced unless otherwise directed by the Engineer. After the backfill is completed

sufficient pavement shall be saw-cut and removed to provide a minimum shoulder width of 9 inches on undisturbed soil on each side of the trench. Saw-cutting is incidental to Pavement Removal.

The Contractor shall waste or dispose of the excavated pavement material in the manner specified in Subsection 3.13. Broken pavement shall not be incorporated into the Project without the specific written approval of the Engineer and in such case, the broken concrete shall be completely absent of wire mesh and reinforcing steel.

D. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

PAVEMENT REMOVAL Unit: Square Yard (nearest S.Y.)

(2) <u>Measurement.</u> Measurement of "Pavement Removal" will be by the square yard. The area of individual removal locations will be determined by measuring the individual locations dimensions to the nearest 0.1 foot, and computing the location's area in square feet. For each Contractor Pay Application, the individual areas will be summed in square feet, converted to square yards and rounded to the nearest square yard.

When mutually agreed by the Contractor and the Engineer, plan quantity for "Pavement Removal" may be accepted as the measured quantity

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per square yard for "Pavement Removal", which payment shall be full compensation for all excavation, hauling, wasting, disposal, and saw-cutting as specified; and for all equipment, tools, labor, and incidentals necessary to complete the work.

3.08 SUPPLEMENTARY BORROW MATERIAL.

A. <u>General.</u> If the volume of suitable excavated materials from the Project site is not sufficient to complete the embankment or subgrade, the Contractor shall provide supplementary borrow material. The Contractor shall notify the Engineer 24 hours in advance of importing borrow material to the Project.

B. <u>Materials.</u> The Contractor shall obtain the Engineer's approval of the supplementary material prior to transporting any supplementary material to the site. Supplementary Borrow Material shall be entirely imperishable, uniform in texture, and capable of being compacted to the requirements of the Contract Documents. Sand is not an approved borrow material. At the Contractor's sole expense, a certified testing laboratory shall collect soil samples, test the soil proposed for import, and report to the Engineer the following information that shall be used as the basis of the Engineer's evaluation for approval of the material:

- 1. Location of the borrow area
- 2. USCS classification
- 3. Optimum moisture content
- 4. Standard density
- 5. Standard Proctor Moisture Density curves

C. <u>Construction Requirements.</u> The Contractor shall provide the Engineer free access to the borrow area at any time the Engineer may request. The Contractor shall provide the Engineer with a copy of the agreement between the Contractor and the owner of the borrow area. The borrow area shall be maintained in such a manner as to prevent erosion and water pollution as specified in Section 4, Obstructions and Incidental Construction. The Contractor's haul route for importing supplemental material to the site shall be approved by the Engineer prior to the commencement of hauling operations. The Engineer will evaluate the route based upon the proposed route's existing pavement conditions, surface type and strength; the route's traffic volume and ability to safely carry increased truck volumes; and the roadside environment and adjacent land uses the route traverses. The Engineer may disapprove a route that, in their opinion, adversely impacts public infrastructure, public safety, and / or private property. The Engineer, at their discretion, and at no extra expense to the Owner, may require the Contractor to control dust during hauling operations. Paved streets and other paved areas shall be kept clean and free of mud, trash, and debris. The Contractor shall, at their cost, repair or replace any public or private property which is damaged by the Contractor's operations.

D. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

SUPPLEMENTARY BORROW MATERIAL Unit: Cubic Yard (nearest 1 CY)

(2) <u>Measurement.</u> "Supplementary Borrow Material" shall be measured as the volume of the compacted imported material, in place, on the project site. Plan quantity stated in the Contract Documents shall be accepted as measured quantity unless the Contractor elects to use the following "Compacted Volume per Truckload" method of measurement. Such election shall be reported to the Engineer, in writing, prior to any supplementary borrow material being transported to the Project.

<u>Compacted Volume Per Truckload.</u> Prior to importing supplemental material, the Engineer's Representative will observe each type of truck to be used in hauling supplemental borrow material being loaded to volumetric capacity and will follow the trucks to a scale approved by the Engineer where one loaded truck of each type will be weighed. The cost of the initial weighing of trucks shall be subsidiary to "Supplementary Borrow Material". The capacity of each type of truck will be determined, to the nearest 0.1 cubic yard, by the net weight of the load and the unit weight of compacted borrow determined by the standard density test (AASHTO T 99) run on the material. The unit weight shall be the maximum material density at the optimum moisture content as determined by AASHTO T 99. For each type of truck used, the number of truckloads of supplementary Borrow Material" shall then be computed as the sum of the products of the number of truckloads times the volume of material per truckload for the various types of trucks used.

The Engineer's Representative will visually compare the volume of supplementary material on trucks arriving at the site to the volume of the first weighed load. If the Engineer's Representative thinks a truck is delivering less material than the load of material used to establish load volumes, the load in question shall be weighed and the volume calculated as above. The Contractor shall pay for weighing any loads that are more than 10 percent below

the established capacity of the truck. The Owner will pay the weighing cost if the load is within 10 percent.

Contractor's failure to comply with these requirements will result in measurement being accepted as plan quantity.

(3) <u>Payment.</u> The amount of completed and accepted "Supplementary Borrow Material" measured as provided above, shall be paid for at Contract unit price per cubic yard, which price shall be full compensation for all excavation of material, hauling, dust control, and placing; and for the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

3.09 EMBANKMENT.

A. <u>Construction Requirements.</u> Prior to proceeding with compaction of embankments requiring Type A or Type AB Compaction, a Standard Proctor Curve as determined by AASHTO T 99 (ASTM D 698) shall be obtained for each type of material to be used. Proctor curves shall be obtained from soil samples selected by a certified testing laboratory from materials excavated by the Contractor. All costs associated with the selection of soil samples and performing the necessary tests to obtain the Proctor curves shall be paid by the Contractor.

The construction of embankments shall proceed in a manner that limits erosion and the deleterious effects of rain during construction. As much as practical, the construction of ditches and other provisions for drainage shall proceed prior to the construction of embankments.

Embankment shall not be constructed on frozen ground.

The surface of the embankment foundation shall be stripped and then tilled or disked uniformly and fully to a minimum depth of 6 inches to assure a thorough bond between the original surface and the new embankment. This tilled or disked layer shall be adjusted to the required moisture content and compacted to the designated type of compaction with this work considered subsidiary to other items in the Contract Documents.

Fill material shall be deposited in loose layers not more than 6 inches thick, and compacted. Areas outside of the subgrade, as defined in Subsection 3.10, shall receive Type AB Compaction. Areas within the subgrade shall receive Type A Compaction. The requirements of the various types of compaction are specified in Subsection 2.09. Compacting operations shall include blading each lift of embankment material to insure uniformity. Water shall be added or removed, if necessary, in order to obtain the required moisture content of the soil involved.

When an embankment is placed against a hillside or an existing embankment with slopes steeper than 4:1, the existing slope shall be benched in sufficient width to permit the placement and compaction of embankment material in 6 inch horizontal lifts.

Where fill or embankment heights are greater than four feet above the existing ground, and only when approved by the Engineer, the Contractor may incorporate rock excavated from the project into the embankment. When approved, the rock shall be placed at the bottom of the embankment in a uniform horizontal layer not exceeding 2 feet in thickness and in a location that will be covered by at least 2 feet of soil upon the completion of the embankment. The rock will be carefully placed so

that all large stones are well distributed and the voids completely filled with smaller stones, soil, or gravel, to form a solid embankment.

Compaction equipment selected by the Contractor to construct an embankment, fill, or subgrade must be of such a design and size necessary to achieve the density requirements specified. Recommendations for compaction equipment may be found in Subsection 2.09 D.

During construction of embankments, soil density tests shall be taken by the Engineer or their representative. When results indicate that compaction does not meet the requirements of these Specifications, the embankment material shall be replaced or recompacted as necessary to meet the specified requirements at no additional expense to the Owner. Additional tests shall be performed on recompacted areas to assure compliance with the requirements.

B. <u>Materials.</u> Embankment materials in areas outside the subgrade shall be approved excavated materials selected from the site or approved supplementary borrow material. Material shall be unfrozen; free of debris, organic material, and rocks (except as provided for above) or clods larger than three inches in any dimension, and; capable of being compacted to the requirements of the Contract Documents. Suitable subgrade materials are specified in Section 3.05.

C. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

EMBANKMENT

Unit: Cubic Yard (nearest 1 C.Y.)

(2) <u>Measurement.</u> The construction of embankments shall not be measured or paid for directly but shall be considered subsidiary to "Unclassified Excavation" if the embankment materials are excavated from the project site or "Supplementary Borrow Material" if the embankment materials are imported into the site unless "Embankment" is listed as a pay item in the Contract Documents.

When listed as a pay item in the Contract Documents, "Embankment" shall be measured as the compacted volume in place on the Project in Cubic Yards. The completed and accepted percentage of plan quantity for "Embankment" shall be considered measured quantity unless the Contractor requests, and it is agreed upon in writing before the start of the project, that 1) another method of quantity determination will be followed or 2) the plan quantity is questionable and further quantity determination is needed. If another method of quantity determination is needed. No payment for back quantities will be allowed.

(3) <u>Payment.</u> When listed as a pay item in the Contract Documents, the amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per cubic yard for "Embankment", which payment shall be full compensation for all hauling, grading, placing, and drying the of materials as specified; and for all equipment, tools, labor, and incidentals necessary to complete the work.

3.10 SUBGRADE PREPARATION.

A. <u>Subgrade Defined.</u> Subgrade is defined as the area upon which curb and gutter or any pavement is to be placed. The subgrade preparation limits for streets extend one foot on each side beyond the back of curb or edge of pavement, whichever is appropriate. Subgrade limits for drive entrances and sidewalks extend to the edge of the entrance or walk. The thickness of the subgrade is as specified in the Geotechnical Report, Project Drawings, or other Contract Documents.

B. <u>Geotechnical Report.</u> Prior to construction plan approval and before a street project will be released for construction, the City/County Engineer will require three (3) approved copies of a geotechnical report, sealed by a Kansas licensed Professional Engineer or a Kansas licensed Geologist. The geotechnical report shall provide site-specific recommendations for the construction of Public Streets and must be submitted for all street or road functional classifications (principal arterials, minor arterials, collectors, sub-collectors and locals). The geotechnical report shall be a part of the Contract Documents.

At a minimum, the following items must be addressed in the report:

(1) Suitable subgrade material shall be defined as entirely imperishable with that portion passing the No. 40 Sieve having a liquid limit not exceeding 40 and a plasticity index not exceeding 25 when tested in accordance with ASTM D 4318. The liquid limit is the water content of the soil at the change between the liquid and the plastic states and shall be tested in accordance with ASTM D 4318. The plastic limit is the water content at the boundary between the plastic and semi-solid states as stated in ASTM D 4318-83. The plasticity index is the numerical difference between the liquid limit and the plastic limit. If the on-site soils do not meet these requirements, the geotechnical report must specify how the on-site soils will be modified to achieve these requirements. As an alternative, the geotechnical engineer may specify alternative liquid limits and/or plastic indices for consideration, provided adequate justification is given.

(2) The report must identify the soils to be used for fill (excluding any material being brought onsite). The report must contain an evaluation of the soils proposed to be used. The evaluation must include all the following as a minimum:

Sieve analysis SCS classification Atterberg limits Maximum dry density (ASTM D 698) Optimum moisture content Moisture density curve (Standard Proctor)

(3) The geotechnical report must also indicate the methods to be used for placement and compaction of the subgrade. The subgrade for all streets shall be treated with fly ash, lime, aggregate base, or other approved material. The geotechnical report shall detail the treatment, placement, incorporation and compaction procedures to be used. Details not specifically covered in the geotechnical report shall conform to the requirements of the KDOT Standard Specifications and the requirements specified herein.

C. Construction Requirements.

(1) <u>All Locations.</u> The Contractor is responsible for regulating the sequence of work, processing a sufficient quantity of subgrade treatment material, providing full depth as specified on the plans, using proper amounts of fly ash, lime or approved material, maintaining the work, and reworking areas necessary to meet the requirements of the Construction Documents.

After compaction and trimming, the subgrade shall be maintained and if, in the opinion of the Engineer, it becomes excessively dry or wet the Contractor will be required to apply water or aerate and re-compact the subgrade. This work will be subsidiary to the pay item "Subgrade Preparation."

The elevation and cross section of the surface shall be thoroughly checked by the Contractor immediately prior to placing pavement on the subgrade. All high places shall be removed and low places filled with suitable material and rolled or tamped until smooth and firm. The use of water on dry subgrade may be required. The water shall be uniformly applied at a controlled rate. The prepared subgrade must support the weight of vehicles and equipment without producing ruts in the surface.

(2) <u>Streets.</u> Subgrade shall be constructed to the requirements of the Geotechnical Report and Project Drawings.

Subgrade shall be trimmed with a rotary style trimmer referencing a taut string line. Other methods for trimming, may be submitted for approval by the Engineer.

The subgrade shall be completed and checked not less than 100 feet in advance of the paving operation. If hauling over the completed subgrade results in ruts or other objectionable irregularities, the Contractor shall restore it to a satisfactory condition. If the subgrade cannot be restored to satisfactory condition, paving shall be stopped.

(3) <u>Alleys and Drive Entrances</u>. The subgrade shall be tilled or disked to a depth of at least 6 inches and the loosened material compacted to the required crown and elevation. Subgrade shall be compacted to the requirements of Type A Compaction as defined in Subsection 2.09. If the soil is unstable at the specified moisture range, the moisture may be varied to the point at which it is stable as determined by the Engineer.

(4) <u>Sidewalks.</u> The subgrade shall be tilled, disced, or scarified to a depth of at least 6 inches and the loosened material compacted to the required slope and elevation. Subgrade shall be compacted to the requirements of Type AB Compaction as defined in Subsection 2.09. If the soil is unstable at the specified moisture range, the moisture may be varied to the point at which it is stable as determined by the Engineer.

D. <u>Measurement and Payment</u>. Subgrade Preparation shall not be measured or paid for directly but shall be subsidiary to other items of the Contract.

3.11 SUBGRADE TREATMENT

A. <u>Subgrade Treatment Defined.</u> Subgrade treatment includes the addition, mixing and manipulation of specified amounts of fly ash, cement, lime, calcium chloride, or other specified additive along with specified amounts of water into the roadbed subgrade followed by compaction, trimming and curing.

B. <u>Construction Requirements.</u> Subgrade treatment shall be performed in areas designated on the drawings or geotechnical report. Subgrade treatment shall extend to one foot past the back of curb or edge of pavement unless specified otherwise in the Contract Documents.

It is the Contractor's responsibility that the full depth of subgrade treatment shown on the Drawings is provided. If it is necessary to provide stabilization deeper than what is shown on the Drawings to maintain the minimum required depth after final trimming, the additional material and labor costs are the responsibility of the Contractor.

If the compacted subgrade is subjected to rain, areas of standing water shall be bladed off and reworked as deemed necessary by the Engineer and at no additional cost to the Owner.

The Contractor must take measures to limit the amount of dusting generated during the application of additives and mixing operations. If unsatisfactory dusting occurs, the Engineer will require the Contractor to take corrective measures.

Unless otherwise specified in the Project Documents, the Contractor shall retain a certified testing laboratory to test the on-site materials and specified additive content to establish the optimum moisture content.

If any of the following requirements for subgrade treatment are not satisfied, the Contractor shall reprocess, recompact and refinish the deficient areas until satisfactory and at no cost to the Owner.

C. Fly Ash, Cement, or Calcium Chloride Treated Subgrade.

(1) <u>Materials.</u> The Contractor shall submit supplier certifications that the material supplied meets the specified requirements.

i. <u>Fly Ash.</u> Fly Ash shall comply with the Physical requirements of ASTM D 5239, paragraph 6.4, and the chemical requirements of ASTM C 618, table 1, for Class C fly ash. Store and handle fly ash in closed waterproof containers before distribution on the subgrade. Partially caked or set fly ash shall not be accepted.

ii. <u>Cement.</u> Cement shall be Type I, IP, I(PM), IS, I(SM), or II cement as designated by and meeting the requirements of ASTM 150.

iii. <u>Calcium Chloride</u>. Calcium chloride shall be one of the types listed below as designated by and meeting the requirements of AASHTO M 144.

(1) Type S (Flake, Pellet or Granule)

(*a*) Grade 1 (77% CACl₂)

(b) Grade 2 (90 $CACl_2$)

(2) Type L (Liquid)

(2) Equipment.

i. <u>Mixing</u>. The Contractor shall use equipment with a recycling or mixing drum and with an automatic water proportioning system. Other equipment must be approved by the Engineer.

ii. <u>Compaction</u>. The Contractor shall use a vibratory roller having a minimum operating weight of 12 tons, with a minimum centrifugal force of 24 tons for the initial compaction of the mixture and a rubber-tired or smooth-wheeled roller to complete the compaction of the surface.

(3) <u>Construction Requirements</u>: The Contractor shall incorporate the additive and water into the subgrade to the specified depth.

i. <u>Preparation of the Subgrade and Distribution of Additive</u>. Before incorporating the additive into the subgrade, the Contractor shall blade the roadway to allow uniform distribution of the additive and distribute the additive in a manner that

minimizes loss of the material. Additive shall not be applied if conditions are such that the material is lost due to wind or rain. Additive that was not properly handled and stored in weatherproof containers shall not be used.

ii. <u>Mixing</u>. The Contractor shall mix the subgrade, additive and water until a homogeneous, friable mixture is achieved. Mixing shall be completed within 30 minutes of adding water to the additive and subgrade. The mixing operation shall not be allowed until the ambient air temperature and surface temperature is 40 degrees F and rising.

iii. <u>Moisture Content</u>. Moisture content immediately before compaction of the treated subgrade shall be not more than 3 percentage points above or below optimum. If the moisture content of the mixture exceeds the optimum moisture content by more than 3 percentage points, the Contractor shall apply additional additive to lower the moisture content at no additional cost to the Owner. The Contractor shall distribute the mixture as needed to maintain the optimum moisture content during the compaction operations.

iv. <u>Compaction</u>. The Contractor shall retain a certified testing laboratory to determine the dry density of the combined materials and provide the information to the Engineer. The coordination with the testing lab, and the cost and responsibility associated with collecting soil samples and performing the testing shall be borne by the Contractor.

When the thickness is greater than eight inches, compact multiple lifts of equal thickness with a maximum lift thickness of eight inches.

The Contractor shall compact the treated subgrade to a minimum of 95% of the combined materials dry density.

The compacted subgrade shall have uniform density and remain stable under construction traffic. The Contractor shall complete the compaction operations within 2 hours of incorporating the additive into the subgrade

v. <u>Finishing</u>. After compacting the treated subgrade, the Contractor shall trim the surface to the specified lines and grades with a rotary style trimmer referencing a taut string line. Other methods for trimming may be submitted for approval by the Engineer. In small irregular areas, the subgrade shall be finished by wetting, blading and rolling. The trimmed surface of the treated subgrade shall be re-compacted with a smooth-wheel or a pneumatic-tire roller. If necessary during the final rolling, the Contractor shall lightly scarify and blade the surface to eliminate equipment imprints.

vi. <u>Thickness</u>. The thickness of the fly ash treated subgrade shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 1,000 square yards. The depth tests or cores shall be provided by the contractor at no cost and shall be reviewed onsite by the Engineer. Where the thickness is deficient by more than ½ inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace, at their expense, the soil/fly ash material where borings are taken for test purposes.

vii. <u>Commencement of Paving or Surfacing</u>. The Contractor may proceed with construction of aggregate base, surfacing or paving 24 hours (three days for Projects outside the City limits) after final rolling provided the Engineer has approved the treated subgrade and also provided that the subgrade supports construction equipment without rutting or pumping. Under special circumstances, the minimum cure period may be reduced if approved by the Engineer. Proof rolling shall be accomplished with a loaded tandem dump truck carrying a minimum loaded weight of 25 tons, with three cycles of loading over three separate paths.

viii. <u>Protecting Fly Ash, Cement, or Calcium Chloride Treated Subgrade</u>. The Contractor shall protect the finished subgrade against drying for 7 days after completion, or until the subgrade is covered with a base or surfacing if covered before 7 days. The finished subgrade shall be protected from drying by spraying with water to maintain a continuous moist condition.

The Contractor may apply an asphalt prime coat instead of keeping the finished surface moist with water. If this option is chosen, SS-1, CSS-1 or MC-250 shall be applied at the rate of 0.22 gallons per square yard to achieve a minimum of 0.13 gallons per square yard residue. Multiple light applications may be necessary to obtain the specified rate of application without run-off.

ix. <u>Weather Limitations.</u> The Contractor shall cover the finished treated subgrade with the specified first lift of aggregate base or surfacing before it is subjected to freezing. If the finished treated subgrade is not covered with a lift of surfacing or aggregate base and is subjected to freezing, the Contractor shall rework the subgrade to the extent established by the Engineer and at no additional cost to the Owner.

D. Lime Treated Subgrade.

(1) <u>Materials</u>: Lime shall be hydrated or pebble quick lime. Hydrated lime shall be any hydrated lime product consisting of hydrated lime and insoluble inert material and complying with the following:

Available Lime Index as Calcium Hydroxide, %, min	. 90
Residue retained on a No. 30 sieve, %, max.	1
Residue retained on a No. 200 sieve, %, max.	20

Pebble quick lime shall meet the requirements of AASHTO M 216. Maximum particle size shall be 3/8".

Hydrated lime for treating soil or soil-aggregate may be manufactured at the jobsite by slaking pebble quick lime. Use equipment specifically manufactured for this purpose and approved by the Engineer.

The Contractor shall submit supplier certifications that the material supplied meets the specified requirements.

(2) Equipment.

i. <u>Scarification</u>. The Contractor shall perform the scarification with positive depth control equipment. A plow or disc shall not be used for the scarification. The Engineer may approve the use of a positive depth controlled motor grader scarifier on a performance basis.

ii. <u>Applying Hydrated Lime Slurry</u>. The Contractor shall use equipment that applies lime slurry through a system of spray bars and nozzles and that can regulate the amount of lime slurry from each nozzle so that the specified amount of lime is placed on the soil and provide the correct quantity of lime without adding an undue quantity of excess moisture to the mixture.

iii. <u>Applying Pebble Quick Lime</u>. The Contractor shall use equipment and methods that will allow the distribution of the pebble quick lime at a uniform rate over the surface to be treated. The Engineer shall approve such equipment and methods on a performance basis.

iv. <u>Mixing</u>. The Contractor shall mix soil, lime and water using equipment with positive depth control that can maintain cutting or mixing heads in a fixed position relative to the wheels or tracks of the machine carrying the head

(3) <u>Construction Requirements:</u> The Contractor shall mix soil, lime, and water either inplace or off-site in a borrow area.

i. <u>Preparation and Maintenance of the Subgrade or Off-Site Borrow Area.</u> Before applying the lime treatment, the Contractor shall use automatic grade controlled equipment to trim the surface of the subgrade or borrow area to the specified lines and grades. In irregular areas, the subgrade or borrow area shall be trimmed by wetting, blading and rolling. Borrow areas shall be trimmed to the profile established by the Contractor. The Contractor shall uniformly compact the trimmed subgrade or borrow area and maintain the subgrade or borrow area as prepared. The Contractor shall provide proper drainage at all times and correct defects that develop in the subgrade or borrow area.

ii <u>Scarification</u>. When the lime is not applied through a mixing chamber to the prepared in-place subgrade or off-site borrow area, the Contractor shall scarify the

prepared area to a minimum depth of 4 inches and a maximum depth of approximately 1 inch less than the specified depth of lime treatment. The Contractor shall determine the depth of lime treatment for off-site areas.

iii. <u>Application Rate of Lime</u>. The application rate of lime is based on the weight of soil being treated and is shown in the Contract Documents. If the application rate is not shown in the Contract Documents, lime shall be applied at a rate of 5% of the weight of soil.

The Contractor shall retain, at the Contractor's expense, a certified testing laboratory to determine the concentration strength of lime and rate of application to obtain the percent of lime specified in the Contract Documents and advise the Engineer accordingly.

iv. <u>Application of Hydrated Lime Slurry</u>. The Contractor shall apply hydrated lime to the scarified areas as slurry and regulate the amount of lime slurry from each nozzle and the speed of the delivery vehicle so that the specified amount of lime is placed on the soil. The concentration of the hydrated lime slurry shall allow the application of the correct quantity of lime without adding an undue quantity of excess moisture to the mixture. The application and mixing of the hydrated lime slurry shall result in a uniform lime concentration.

Hydrated lime slurry shall be applied the same day it is produced. The Contractor shall continuously agitate the hydrated lime after the batch is made. If the liming operation is interrupted, the Contractor shall continue agitating the hydrated lime in storage. If the interruption will be lengthy, the Contractor has the option to cease mixing. In either case, prior to resuming liming operations, the Contractor shall retest the concentration and adjust the rate of application accordingly. The Engineer will verify the results.

v. <u>Application of Pebble Quick Lime</u>. The pebble quick lime shall be applied at a uniform rate over the entire area to be treated.

vi. <u>Adding Water.</u> The Contractor shall add water, as necessary, to facilitate mixing of the lime and soil. During the initial mixing operation, water shall be added to obtain a minimum moisture content of 8% above the optimum moisture content of the raw soil being treated. The Engineer will measure the moisture content immediately after the mixing is completed, and before sealing or compacting.

vii. <u>Preliminary Mixing.</u> The Contractor shall mix the lime, soil and water to the dimensions specified in the Contract Documents. For off-site borrow areas, the Contractor shall determine the depth and width. Mixing shall involve a minimum of 2 passes with the mixer traveling in the primary direction. Mixing shall continue until 95% of the mixture passes the 2 inch sieve as determined by the Engineer.

viii. <u>Aging.</u> Seal the mixture to prevent moisture loss by lightly rolling with a pneumatic-tired roller. Blade the surface to shed water.
(1) <u>Material Mixed In-Place</u>. Maintain the mixture in the sealed condition for a minimum of 24 hours prior to commencing final mixing.

(2) <u>Material Mixed in a Borrow Area</u>. Maintain the mixture in the sealed condition a minimum of 24 hours or until the mixture is ready to be used.

The Contractor shall keep the surface moist by spraying with water. If the final mixing is not performed within 14 days of the preliminary mixing, the Contractor shall add 1% lime by weight of raw soil, in the final mixing operation. If the Contractor knows the final mixing will not be performed within 14 days, the Contractor may reduce the rate of lime applied in the initial application by 1%, and add that 1% in the final mixing.

ix. <u>Final Mixing.</u> After the initial mixing and aging (24 hours) is completed, the Contractor shall re-mix the mixture to the specified depth $(\pm \frac{1}{2} \text{ inch})$ and width, until 95% of the mixture passes the $\frac{11}{2}$ inch sieve and 40% passes the No. 4 sieve as determined by the Engineer. Periodic mixing over an interval of time is allowed to facilitate the breakdown in particle size. The Contractor shall bring the mixture to the moisture content required for compaction.

x. <u>Compaction of the Mixture.</u> When the material is mixed in-place, the Contractor shall compact the material after completing the required final mixing. When the material is mixed off-site, the Contractor shall excavate and haul the material to the project site, place the material on the prepared and trimmed surface, and compact the material. The Contractor shall compact the mixture such that, in the opinion of the Engineer, no further consolidation is gained by continued rolling. Moisture content at the time of compaction shall be no more than 3 percentage points above or below optimum and shall be maintained throughout the compaction operations. The Contractor shall blade the mixture to eliminate surface irregularities during the compaction operations. When the completed thickness is greater than eight inches, compaction shall occur in multiple lifts.

xi. <u>Finishing</u>. After compacting the lime treated subgrade, the Contractor shall trim the surface to the specified lines and grades with a rotary style trimmer referencing a taut string line. Other methods for trimming must be approved by the Engineer. In small irregular areas, the subgrade shall be finished by wetting, blading and rolling. The trimmed surface of the treated subgrade shall be re-compacted with a smooth-wheel or a pneumatic-tire roller. If necessary during the final rolling, the Contractor shall lightly scarify and blade the surface to eliminate equipment imprints.

xii. <u>Curing and Protecting Lime Treated Subgrade</u>. After the compacted mixture is finished, cure the lime treated subgrade for 7 days by keeping the finished surface moist with water to prevent drying. Do not allow vehicles or equipment (other than watering equipment) on the finished lime treated subgrade during the curing period.

At the Contractor's option, apply an asphalt prime coat instead of keeping the finished surface moist with water. If asphalt prime coat is used, apply SS-1, CSS-1 or MC-250 at the rate of 0.22 gallons per square yard to achieve a minimum of 0.13

gallons per square yard residue. Multiple light applications may be necessary to obtain the specified rate of application without run-off.

When a bituminous base course or aggregate base is to be constructed upon the lime treated subgrade, the Engineer may reduce the curing period to when the lime treated subgrade gains sufficient strength to support the construction and hauling equipment. When a bituminous base or aggregate base course is constructed on the lime treated subgrade, the first lift of the base or subbase is considered the curing medium. Repair any damage to the lime treated subgrade due to construction of the base course or subbase.

xiii. <u>Seasonal Limitations.</u> The Contractor shall not perform lime treatment operations if the ambient air temperature is below 40°F, or the soil is frozen.

(1) <u>Projects with Rigid Pavement</u>. The Contractor shall cover the finished lime treated subgrade with base or pavement before it is subjected to freezing. If the lime treated subgrade is not covered by base or pavement and is subjected to freezing, the Contractor shall re-compact the lime treated subgrade before placing any pavement. The Engineer will determine the extent of the re-compaction which shall be completed at no additional cost to the Owner.

(2) <u>Projects with Flexible Pavement.</u> The Contractor shall cover the finished lime treated subgrade with the specified lift of asphalt or aggregate base before it is subjected to freezing. If lime treated subgrade is not covered with a lift of HMA or aggregate base and is subjected to freezing, the Contractor shall add additional lime and re-compact the lime treated subgrade before placing any pavement. The Engineer will determine (by laboratory or field tests) the additional quantity of lime to add, if any, and the extent of the re-compaction which shall be completed at no additional cost to the Owner.

E. Bid Item, Measurement and Payment.

(1) Bid Item:

(*) SUBGRADE TREATMENT (**) Unit: Square Yard (nearest 1 S.Y.)

- * Specified thickness of subgrade treatment in inches
- ** Type of subgrade treatment, i.e. Fly Ash, Cement, Lime, or Calcium Chloride

(2) <u>Measurement.</u> "Subgrade Treatment" shall be measured by the area treated for each of the various thicknesses and types of subgrade treatment. The area of individual treatment locations will be determined by measuring the individual location's dimensions to the nearest 0.1 foot, and computing the location's area in square feet. For each Contractor Pay Application, the individual areas will be summed in square feet, converted to square yards and rounded to the nearest square yard.

When mutually agreed by the Contractor and the Engineer, plan quantity for "Subgrade Treatment" may be accepted as the measured quantity.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per square yard for each of the various thicknesses and types of "Subgrade Treatment", which payment shall be full compensation for all materials, application, mixing, compaction, trimming, curing and protecting as specified; and for all equipment, tools, labor, and incidentals necessary to complete the work.

3.12 AGGREGATE BASE – TYPE AB-3.

A. <u>Materials</u>. Materials shall comply with the requirements for AB-3 as specified in Section 1104 of the KDOT Standard Specifications, except the allowable gradation limits will be as shown in the table below.

Sieve Size	% Retained
1-1/2"	0-5
3/4"	15-30
No. 4	45-60
No. 8	55-70
No. 40	70-85
No. 200	85-95

The Contractor shall retain a certified testing laboratory to determine the standard proctor, gradation and plasticity index of the material to be supplied and submit the information to the Engineer prior to construction of the aggregate base. The Engineer shall also receive a certification with each load stating that the AB-3 material is from a KDOT approved stockpile.

B. Construction Requirements.

(1) <u>Subgrade Preparation and Trimming</u>. Subgrade shall be watered, scarified, and bladed and compacted to meet 95% compaction requirements within a moisture range of +/-3% of optimum moisture. Subgrade shall be proof rolled with a loaded tandem-axle dump truck carrying a minimum weight of 25 tons. Soft or unsuitable areas **identified** during the proof rolling operation shall be excavated and replaced with approved material. Excavation of the subgrade shall be paid for as "Unclassified Excavation". Installation and compaction of approved material shall be paid for as the specific material. [**For Shawnee County Administered projects only – excavation of the subgrade and installation and compaction of approved materials shall not be paid for direct but considered subsidiary to other items of the contract.]**

(2) <u>Mixing and Moisture Content.</u> Aggregate shall be delivered or mixed onsite to a uniform condition with a moisture content at +-**3% of optimum moisture**.

(3) <u>Placement.</u> Aggregate shall be placed to the depth and thickness shown on the plans or as directed by the Engineer. Maximum compacted lift thickness of any one lift shall be 8 inches. Material shall not be placed on frozen subgrade.

(4) <u>Compaction</u>. The Contractor shall compact the aggregate base to a minimum density of 95% of the standard density at a moisture content of +/-3% of the optimum moisture.

(5) <u>Curing.</u> Aggregate base shall be protected from traffic, including construction traffic, for a minimum of 3 days unless otherwise approved by the Engineer. Aggregate base shall

support a loaded tandem axle dump truck carrying a minimum weight of 25 tons before placement of pavement.

(6) <u>Finishing.</u> Upon completion of the curing period, the aggregate base shall be trimmed with a rotary style trimmer referencing a taut string line. Other methods for trimming must be approved by the Engineer. Aggregate base shall be compacted after trimming with a steel-drum or pneumatic-tire roller. This requirement shall not apply where aggregate base is used as a final surface.

(7) <u>Re-use of Trimmings.</u> If contractor plans on re-using AB-3 trimmings, then the stock pile shall be tested for gradation and moisture content.

- C. Bid Item, Measurement and Payment.
 - (1) Bid Items.

	(*) AGGREGATE BASE – TYPE AB-3	Unit: Square Yard (nearest 1 S. Y.)
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AGGREGATE BASE – TYPE AB-3

* Specified thickness in inches

Unit: Ton (nearest 0.1 Ton)

(2) <u>Measurement.</u> Measurement of the various thicknesses of "(*)" Aggregate Base – Type AB-3" shall be by the in place area constructed. Horizontal dimensions of individual areas of the various thicknesses of Aggregate Base - Type AB-3 shall be measured to the nearest 0.1 foot with the sum of the areas thus measured, converted and rounded to the nearest square yard for each pay request. When the thickness of the Aggregate Base is not specified in the project documents or when used to repair subgrade for pavement patches, it shall be measured by the ton using load tickets or and assumed unit weight of 156 pcf.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price for each of the various thicknesses of "(*)" Aggregate Base – Type AB-3" or the unit price per ton when no thickness is specified. Such prices shall be full compensation for all hauling, placing, grading compaction, trimming and curing as specified; and for all labor, equipment, materials, tools, and incidentals necessary to complete the work.

3.13 DISPOSAL OF EXCESS MATERIAL.

A. <u>General</u>. Unless otherwise specified in the Drawings or in the Contract Documents, any excess excavated material, structures, pavements, rocks, trash, debris and vegetation, or any other item designated to be removed shall be disposed of by the Contractor. Such disposal shall be at no additional cost to the Owner unless materials with special disposal requirements not normally found in similar work are encountered. If material requiring special disposal is encountered, the Engineer must be notified immediately for agreement that the material requires special disposal. If the means of special disposal is not included as a pay item in the Project Documents, the Contractor shall submit a price for the work to the Engineer for consideration by the Engineer and Owner. Once the price is established, a Change Order shall be written and approved prior to the Contractor proceeding with the work.

Disposal of all materials shall be accomplished in accordance with all Federal, State and local ordinances and regulations.

The Contractor shall not dispose of any excavated material until certain there is sufficient material to complete all necessary project embankments and the Engineer approves such disposal. If suitable excavated material is disposed of, approved borrow material shall be provided at the Contractor's expense.

B. <u>Measurement and Payment</u>. Disposal of Excess Material shall not be measured or paid for directly but shall be subsidiary to other items of the Contract.

END OF SECTION

SECTION 4

OBSTRUCTIONS AND INCIDENTAL CONSTRUCTION

4.01 GENERAL.

The work covered in Section 4 consists of incidental construction and clearing of obstructions to permit construction of public, developer, and utility company projects through, past and around existing properties and utilities.

The requirements of Section 4 shall apply to all types of work including but not limited to underlying public and private utilities installation, reconstruction or repair. The requirements of Section 4 also apply to any person, agency, company, organization, private contractor, plumber, electrician, DOT, Public Works Department, utility company or any other such persons, businesses, or agencies that disturb public right-of-ways and easements, for any reason. For the purpose of brevity the party responsible for disturbing the public right-of-way and easements shall be referred to herein as the "Contractor."

"Utilities" or "Utility" as used in these Standard Specifications shall mean any overhead or underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, poles, towers, pedestals, boxes or other such facilities or attachments which have been installed underground, on the surface, or overhead to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone, communications, digital information, cable television, drainage, traffic control, sewage, or water.

"Utility owner" or "utility company" shall mean the party responsible for operating a utility, as defined above, within the public right-of-way and easements, or their contractor.

"Utility Project" shall mean the planned construction, reconstruction, maintenance, or repair of utilities initiated by a Utility Owner and at least partially taking place on public right-of-way or easements or property owned by the City or County.

4.02 PRIVATE PROPERTY

A. <u>Easements.</u> No work shall be performed on private property unless an easement or right of entry has been obtained for the purpose of doing the work. See Subsection 1.06.

B. <u>Fences and Retaining Walls.</u> Where fences or retaining walls interfere with the construction work, and the Project Documents do not call for their removal, the Contractor shall be responsible for notifying the Engineer prior to removal of any fence or wall for a decision on the limits of removal and the payment for this work. The Engineer may request that the Contractor contact the property owner to coordinate the work. In areas used for livestock, fences not shown for removal shall be maintained in good condition at all times or temporarily relocated in order to contain the livestock during construction. Such temporarily relocated fence shall be re-erected in the original location after the construction is complete. The replacement, re-erection, and/or re-setting of fences and walls shall be made in a manner that results in conditions as good as or better than existed prior to the start of construction as determined by the Engineer.

C. <u>Septic Tank Systems</u>. Where septic tanks or septic tank lateral systems, which are to remain in service on private property, interfere with or are in the line of construction, the Contractor shall be responsible for notifying the Engineer prior to any removal so that a decision can be made on the removal limits and payment for the work. The Contractor will be responsible for replacement of any part of the system removed in such a manner as to restore the system to a condition as good as or better than existed prior to the start of construction as determined by the Engineer.

D. <u>Sprinkler Systems</u>. Sprinkler systems for lawn and landscaped areas affected by construction shall be neatly cut and capped at the limits of the construction by the Contractor. The Contractor shall coordinate this work with the affected property owner(s). Sprinkler systems located within existing right-of-way will not be repaired. However, the Contractor shall carefully remove and salvage to the property owner any sprinkler heads or sprinkler system controls that may have been located on the public right-of-way. If a sprinkler system located on private property is damaged, it shall be replaced by the Contractor prior to permanent seeding or sodding of the area. The Engineer shall notify the Contractor if any special agreements have been made with the property owner regarding the sprinkler system. Sprinkler system work shall be considered subsidiary to other items of the Contract.

4.03 EXISTING UTILITIES

A. <u>Contractor Responsibilities</u>. The Contractor shall provide their contact information in writing to responsible representatives of utilities, railroads, or any other facilities or property that will be affected by their operations. Such notice shall be given not less than seven days before starting work in any area. The Contractor shall thereafter coordinate their work with the work necessary to protect or relocate such utilities, property or facilities, and cooperate to the fullest extent to avoid damage or service interruptions.

The Contractor shall have the locations of existing utilities marked in the field prior to the commencement of grubbing or excavating. For obtaining underground utility locations, the Contractor shall utilize the Kansas One Call service, telephone no. (800) 344-7233.

The Contractor shall furnish all necessary information to the utility companies involved as to the nature and extent of the work and shall obtain their cooperation and instructions in locating and protecting all overhead and underground pipes, cables, and other utilities. All utility line locations shown on the Drawings are approximate. House connections are generally not shown.

B. <u>Protection.</u> The Contractor shall protect utilities from damage by workers, equipment, and natural causes. Where utility poles interfere with construction, the Contractor shall arrange with the utility companies concerned to relocate or properly anchor and tie back the poles.

C. <u>Damaged Utilities.</u> Any damage to utility lines, house connections or structures by action or negligence of the Contractor shall be repaired or replaced by the Utility Owner at the Contractor's expense. This shall also apply to utilities installed after the award of the contract and utilities not shown on the Drawings but marked in the field.

D. <u>Conflicting Utilities.</u> Wherever the proposed sewers, waterlines, or appurtenances in this project cross or are to be located over or under underground pipes, cables or conduits, the Contractor shall uncover the pipes, cables or conduits at least 3 days prior to construction to allow the Engineer sufficient time to check grades and the Utility sufficient time to move their lines or appurtenances, should it be necessary. If utility lines or their appurtenances obstruct construction of sewers and

appurtenances, they will be relocated by the Utility Owner. Ample notice shall be given to permit the required relocation to be accomplished without delaying construction of the project. Any delay in construction resulting from the relocation of utility lines or their appurtenances will not be grounds for modification of the contract unless agreed upon by the Engineer. In cases of utility conflicts, the Contractor may elect to tunnel in lieu of open cut, at no additional cost.

4.04 RESTORATION OF PUBLIC RIGHT- OF-WAY FOLLOWING UTILITY WORK.

The requirements set forth in this Section apply to the work of private or public utility companies, as defined in Subsection 4.01, working within public right-of-way.

A. <u>Hydro Excavation Process</u>. The maximum diameter of a cored hole in pavement for a hydro excavation procedure shall be six inches. After completion of the hydro-excavation process, each hole shall be backfilled with flowable fill to the bottom of the adjacent pavement and then filled with high strength non-shrink grout to the same level as the existing pavement. For concrete pavements, if the hydro excavation process results in more than 2 holes in a single panel, then the entire panel shall be replaced as specified in Subsection 4.06.

For asphalt pavements and concrete pavement overlain with asphalt, if the hydro-excavation process results in holes within 4 feet of each other (measured from center to center of the holes), then a rectangular full depth asphalt patch shall be constructed normal to centerline of the roadway by full depth sawcutting and removal within limits one foot beyond the edge of each hole. Should the patch area as defined above be within **three** feet of the gutter toe or lane line, the patch shall be extended to the respective gutter toe or lane line. Asphalt pavement and asphalt on concrete pavement patches required due to hydro-excavation shall be finish milled and overlaid as specified in Paragraph 4.06 C (3).

This restoration process shall also be followed for exploratory "pothole" excavations to expose existing utilities.

The work and cost of restoring pavements following hydro excavation shall be the responsibility of the party initiating the excavation.

B. Utility Project Restoration (Projects within City Limits Only).

(1) <u>Permitting Requirements.</u> All planned utility projects shall be coordinated with the City in order to ensure the preservation of new pavement or new overlay for a minimum of 36 months after new pavement or overlay is constructed. The City will notify the utility companies of all planned street improvement or repair projects at regularly scheduled utility coordination meetings to enable utility companies to complete their planned projects before new pavement or overlays are constructed. Non-emergency utility repair work that removes and replaces pavement less than 3 years old will not normally be approved and will only be allowed with the approval of the City Engineer.

To excavate in the public right-of-way, franchise utility companies must obtain a permit from the Public Works Department. Patches that are made as a result of utility cuts shall be restored as noted in each utility's franchise agreement and as specified herein. The utility shall pay the entire cost of right-of-way and public infrastructure restoration necessitated by the Utility Company's actions. Utility projects shall provide for erosion and water pollution control as required by Section 4.20 of these Specifications and all applicable laws.

The City of Topeka Brick Street, Alley and Sidewalk Policy applies to all utility companies and any other party working within City right-of-way and easements. A copy of this policy may be obtained from the Office of Public Works Administration.

All Projects within the public right-of-way require work zone traffic control. The utility company or their contractor shall provide traffic control in compliance with the MUTCD, Section 4.24 of these Standard Specifications, the City Standard Detail Drawings for Traffic Control, and as directed by the City Traffic Engineer. A "Traffic Disruption Permit" is required prior to the start of work. This permit may be obtained by contacting the City of Topeka Engineering Division – Traffic Section at phone number (785) 368-3842 a minimum of 72 hours in advance of starting work.

(2) <u>Materials.</u> All materials used for the restoration of the public right-of-way and easements shall meet the requirements of these Standard Specifications.

(3) Construction Requirements.

i. <u>Initial Removal of Pavement</u>. When trenches for the installation or repair of utilities are excavated in paved areas, the existing pavement shall initially be removed only to the limits required to permit safe trench excavation as specified in Subsections 2.02, 2.03, and 2.04.

Concrete and asphalt pavements shall be full depth sawcut at the planned limits of the trench prior to the removal of pavement. The Contractor shall remove and dispose of the pavement as specified in Subsection 3.13.

ii. <u>Brick Streets, Alleys and Sidewalks.</u> If the trench or other excavation encroaches upon stone curbs or streets, alleys or sidewalks in the public right-ofway that have an exposed brick surface or one or more underlying layers of brick, the requirements of Subsection 4.05 and the City of Topeka Brick Street, Alley and Sidewalk Policy shall apply. Upon encountering stone curb or pavement containing bricks, the utility company shall contact the City Street Maintenance Section and request instruction relative to preservation of the brick. The utility company shall not proceed with any excavation of pavement containing brick until authorization from the Street Maintenance Section is received.

The utility company and the Street Maintenance Section shall review Figure 4.5"City of Topeka Brick Street Inventory Map" and Section 4.04 of these Standard Specifications to determine necessary preservation measures for the restoration of the brick street, alley or sidewalk, and/or stone curbs following completion of the utility work.

Anytime a street, sidewalk or alley that has an exposed brick surface is disturbed, all restoration, subject to certain specific exceptions, shall be completed using brick of like kind and color, and in accordance with the City of Topeka Brick Street, Alley and Sidewalk Policy and as specified herein.

Any bricks that require removal and will not be used in the subsequent restoration shall be carefully removed and salvaged to the City Street Maintenance Section in accordance with the City of Topeka Brick Street, Alley and Sidewalk Policy and as specified herein. The brick salvage requirement includes those bricks found at depth in an existing pavement structure.

When pavements containing brick and/or stone curbs require removal to allow excavation of trenches, the utility company shall mark the planned limits of the excavation. After a representative of the Department of Public Works approves the limits as marked, the utility company may proceed with removal of the bricks and/or curbs using care, as specified in Subsection 4.05, to not damage the bricks or stones. The bricks shall either be salvaged to the Street Maintenance Section or be used in preserving and restoring the brick pavement as specified in Subsection 4.05.

iii. <u>Backfill.</u> During the course of removing pavement and installing or repairing the utilities and backfilling, the utility company shall protect the pavement beyond the edges of the trench or excavated area from being damaged.

The preferred material for backfilling an excavation under pavement is flowable fill, meeting the requirements of Section 5.09. The utility company, or their contractor, shall verify de-watering/curing is complete prior to covering flowable fill material.

If flowable fill is not used in backfilling an excavation, the City may require Standard Proctor Curves and soil density tests to be provided to the City Construction Manager on the backfill material to show that the required compaction is achieved at each excavation. The backfill material shall be deposited in loose layers not more than 6 inches thick and compacted. Type A Compaction, as specified in Subsection 2.09, shall be achieved in all areas to be paved except sidewalks. Sidewalk subgrades shall be compacted to the requirements of Type AB Compaction.

If the disturbed pavement had subgrade treatment beneath it, then subgrade treatment to the requirements of Subsection 3.11 must be performed as part of the restoration process. The subgrade additive shall be the same material as the adjacent undisturbed subgrade unless approved otherwise.

iv. <u>Final Removal of Pavement and Patching</u>. After the utility facility is installed or repaired, and backfilling is completed as specified, additional existing pavement shall be carefully removed to provide a minimum shoulder width of 9 inches of undisturbed subgrade on each side of the trench. If the subgrade is unstable, it shall be excavated to a depth determined by the Engineer and backfilled with Aggregate Base – Type AB-3 as specified in Subsection 3.12.

Asphalt pavements shall be full depth sawcut to neat lines at locations which will result in the specified minimum 9-inch subgrade shoulder. The width from sawcut to sawcut shall be filled with asphalt (referred to in the following as "the patch") as specified in the Standard Detail Drawings DT-007 or DT-008 and **Section 7**, and match the thickness of the existing pavement minus the final overlay. Pavements consisting of an asphalt overlay on concrete shall be replaced in kind as specified in Standard Detail Drawing DT-007 or DT-008 and in **Section 7**.

Concrete pavements shall be full depth sawcut, removed and replaced to the limits of the panels partially disturbed unless otherwise directed by a representative of the Department of Public Works. The entire width from sawcut to sawcut shall be replaced with concrete as specified in Standard Detail Drawing DT-017 and Section 5.

Brick pavements shall have additional pavers removed to provide the specified 9inch subgrade shoulder. Following the establishment of the subgrade shoulder, brick pavements and stone curbs shall be restored as specified in Subsection 4.04.

v. <u>Finishing Asphalt Patching</u>. The area surrounding the full depth repair area (the patch) shall be milled to a depth of 2 inches. Final mill and overlay limits shall be perpendicular to the centerline of the roadway unless approved otherwise.

(1) Asphalt Pavements Less Than Three Years Old. When the existing asphalt pavement is less than three years old, the area milled shall surround the patch to the width of the affected lane in the transverse direction and at least 10 feet in the longitudinal directions with at least one foot of milled surface surrounding all squared edges of the patch. If the milled area, as described above, extends into the adjacent lane, then the entire adjacent lane width shall also be milled. If the distance between two milled areas is closer than 20 feet, then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than three repair areas in a 100 foot section of street, then the areas shall be combined into one large mill and overlay area. The requirements set forth in this paragraph also apply to asphalt on concrete pavements that have an asphalt surface course less than three years old.

(2) <u>Asphalt Pavements More Than Three Years Old.</u> When the existing asphalt pavement is more than three years old, the area milled shall extend one foot beyond each squared edge of the patch. If the squared edge of patch is within three feet of the gutter toe, then the milled area shall be extended to the gutter toe. If the distance between two milled areas is closer than 10 feet then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than three repair areas in a 50 foot section of street, then the areas shall be combined into one large mill and overlay area.

Where pavement markings are removed or disturbed, the company shall replace the markings in kind and meeting the requirements of Subsection 4.22.

Should company's construction activities damage any pavement surface, whether new or existing, the damaged pavement shall be repaired and/or full concrete panels removed and replaced at the utility company's sole expense.

The use of temporary steel traffic plates to cover areas that have not been patched and are open to traffic shall be limited to 30 calendar days. When permanent patches cannot be completed within a 30 day period, temporary patches shall be constructed.

Temporary patches shall be constructed by backfilling the trench from a depth 4 inches below the pavement surface with a minimum of a 12-inch thickness of Aggregate Base – Type AB-3 meeting the requirements of Section 3.12. The aggregate base and the vertical edges of the patch area shall be covered with a minimum 5 mill thickness of plastic sheeting to serve as a bond breaker. The upper 4 inches of the temporary patch area shall be filled with a rapid set concrete or similar material. The patch surface shall be capable of supporting traffic without chucking or permitting excessive moisture to enter the subgrade for the period the temporary patch is needed.

The utility company shall maintain the temporary patches and make any necessary repairs should chucking or excessive settlement occur.

The utility company is responsible for final cleaning, grading and seeding of all disturbed areas immediately after completion of work in a particular area and as the project progresses.

The work and cost of restoring pavements and right-of-way following utility company projects shall be the responsibility of the utility company.

4.05 BRICK PAVEMENTS. This section provides guidance and establishes the requirements for the salvage, preservation, and maintenance of existing brick streets, alleys, and sidewalks and the construction of new brick sidewalks.

A. <u>Scope.</u> Anytime a street, sidewalk or alley that has an exposed brick surface is disturbed all construction or restoration shall be completed, subject to certain specific exceptions, using brick of like kind and color in accordance with the City of Topeka Brick Street, Alley and Sidewalk Policy and as specified herein.

Any bricks that require removal and that will not be used in the subsequent construction, reconstruction, or patching shall be carefully removed and salvaged to the City Street Maintenance Section in accordance with the City of Topeka Brick Street, Alley and Sidewalk Policy and as specified herein. The brick salvage requirement applies to all bricks including those overlain with asphalt and those found at depth in an existing pavement structure.

The streets with exposed brick surfaces designated on the map shown in Figure 4.1 – "City of Topeka Brick Inventory Map" will be subject to the preservation, repair and reconstruction provisions of this Standard Specification. Other streets and alleys which have a brick base but have been overlain with asphalt will be subject to the brick salvage provisions. This requirement does not apply to City Improvement Projects where brick elements may be replaced with a different material after appropriate approvals. Any excavation within the right-of-way must be repaired in accordance with (IAW) Topeka *Municipal Code 12.30.120 Right-of-way repair and restoration*.

B. <u>Criterion for Determination of Required Preservation of Brick Streets, Brick Alleys, Brick</u> <u>Sidewalks and Stone Curb.</u>

(1) <u>Brick Streets Designated for Preservation.</u> Any person, agency, company, or organization that disturbs or excavates the surface of an existing exposed brick street, alley or sidewalk designated for preservation on Figure 4.1, "City of Topeka Brick Inventory Map", for any purpose including maintenance, surface repairs, or repair or replacement of underlying utilities, shall replace or restore the surface in the same installation pattern and with brick of like kind and color.

(2) <u>Brick Streets Not Designated for Preservation.</u> Streets with exposed brick surfaces which are not designated for preservation are subject to the brick salvage requirements specified herein. Following completion of the construction or utility work, the party responsible for disturbing the street shall repair the street using asphaltic concrete or other approved material.

(3) <u>Asphalt Overlay on Brick Streets.</u> Streets with brick bases but overlain with asphalt are subject to the brick salvage requirements contained herein. Following completion of the construction or utility work, the party responsible for disturbing the street shall repair the street using asphaltic concrete or other approved material.

(4) <u>Brick Alleys.</u> All brick alleys are subject to the brick salvage requirements contained herein. Following completion of utility work or construction, the party responsible for disturbing the alley shall repair the alley with asphaltic concrete. However, if the exposed brick alley is a contributing factor to a registered state or national historic property and its surrounding environs, or a Historic District, the alley shall be preserved as much as possible in accordance with the requirements stated herein. The Contractor completing the work in the alley shall contact the City Office of Public Works Administration to request a determination of whether or not the alley requires preservation on the basis of historic environs.

(5) <u>Brick Sidewalks.</u> When reconstruction or repair of brick sidewalks located in the public right-of-way is required in a localized area or spot repair of 15 feet in length or less, the sidewalk shall be reconstructed using brick of like type and color and laid in the same pattern as the adjacent sidewalk. In larger areas, the sidewalk shall be replaced but may be replaced with concrete unless the particular section of brick sidewalk meets one of five Conditions defined in Table 4.05 B (5) below.

Criterion for Determination of Required Brick Sidewalk Preservation		
Condition 1	The brick sidewalk or stone curb is located on a block within the	
	vicinity of a designated state or national historic property and its	
	environs and has not received approval of the Topeka Landmarks	
	Commission for concrete or similarly approved alternative.	
Condition 2	The brick sidewalk or stone curb is located within or adjacent to a	
	Historic District or designated Local Landmark.	
Condition 3	The brick sidewalk or stone curb is located on a block within a	
	Neighborhood Plan Element of the City's Comprehensive Plan and is	
	recommended to be preserved as a brick sidewalk or stone curb as	
	applicable consistent with said plan.	
Condition 4	Any brick sidewalk location not covered by Conditions 1,2, or 3 but	
	located on a block where at least 60% of the sidewalk on one side of the	
	street is brick and maintained in level and safe condition.	
Condition 5	The property owner adjacent to the public sidewalk does not agree to	
	replace the brick sidewalk with a concrete sidewalk and said property	
	owner has demonstrated a history of adequately maintaining the existing	
	brick sidewalk to level and safe conditions.	

Table 4.05 B (5)

If one of the five conditions listed above exists, the sidewalk shall be reconstructed or replaced in brick. However, on City funded projects, if the property owner adjacent to the City- owned sidewalk does not agree to replace the brick sidewalk with a concrete sidewalk (Condition 5 above) and none of the other conditions are applicable, the owner shall be required to pay the additional cost to reconstruct the sidewalk in brick versus concrete.

(6) <u>Stone Curbs.</u> Stone curbs and brick gutters shall be preserved "in place" as much as possible. In areas where existing curbs are constructed of stone, the stone curb shall be preserved if any of the Conditions 1, 2, or 3 of Table 4.05 B (5) are present. Preservation shall be accomplished by resetting existing stone curb, replacing the existing curb stone with stone of like kind or casting concrete curbs made to match the height, color, and characteristics of the adjacent stone. In areas where preservation of stone curb is not required, stone curbs shall be carefully removed and salvaged to the City.

C. Materials.

(1) <u>Brick Pavers for Streets and Alleys.</u> Paving bricks shall be salvaged from the site or brick pavers of like kind and color imported to the site. Unless otherwise specified in the Project Documents or approved by the Engineer, paving bricks imported to the site shall meet the requirements of ASTM C1272 Application PS (Type F) and have a minimum compressive strength of 10,000psi. The Contractor shall provide a manufacturer's certification to the Engineer that the material satisfies the requirements specified.

(2) <u>Brick Pavers for Sidewalks.</u> Paving bricks for sidewalks shall be salvaged from the site or brick pavers of like kind and color imported to the site. Unless otherwise specified in the Project Documents or approved by the Engineer, paving bricks imported to the site shall meet the requirements of ASTM C902 Application PS (Type F) and have a minimum compressive strength of 8,000psi. The Contractor may also construct sidewalks using brick meeting the requirements for street and alley pavers as specified above. The Contractor shall provide a manufacturer's certification to the Engineer that the material satisfies the requirements specified.

(3) <u>Setting Bed / Leveling Base Sand.</u> Sand for brick setting beds and leveling bases shall be type FA-A as defined in Section 1102 of the KDOT Standard Specifications and as stated in Subsection 5.01.

(4) <u>Reinforced Concrete Pavement.</u> Materials for reinforced concrete pavement shall meet the requirements of Pavement Class A Concrete and welded wire mesh specified in Subsections 5.01 and 5.03, respectively.

D. Construction Requirements.

(1) <u>Removal and Salvage of Bricks.</u> When bricks are removed, care shall be taken by the Contractor or utility company to prevent damage to the bricks. Any bricks not used in restoration or construction shall be salvaged, cleaned and neatly stacked on pallets by the Contractor or utility company. The Contractor or utility company shall transport the salvage bricks to a location designated by the Street Maintenance Section.

The Contractor or utility company shall safely secure bricks that have been removed to prevent theft or damage until the bricks are reset or transported to the City.

Providing pallets and removing, salvaging, cleaning, stacking, transporting, and stockpiling of the bricks is subsidiary.

(2) <u>Brick Streets.</u> This Subsection pertains to exposed brick streets or alleys that will be preserved and repaired or reconstructed to their original brick surface appearance. Prior to removal of any brick street or alley surface the Contractor or the Project Surveyor shall mark the limits of the brick street replacement for the Engineer's approval. During removal of the existing brick street surface, due care shall be exercised to prevent damage to the bricks removed and the adjacent remaining brick pavement.

The reconstructed brick street shall have the following pavement structure from top to bottom:

- One course of brick pavers
- Setting bed or leveling base of non-plastic, clean, FA-A Sand
- 7" Reinforced Concrete Pavement
- 12" Subgrade Preparation to the requirements of Type A compaction as defined in Subsections 3.10 and 2.09 respectively.

i. <u>Subgrade</u>. Upon excavation to the depth required for the concrete base course, the existing subgrade shall be removed an additional 6 inches, scarified, and recompacted. A lift of soil shall then be placed and compacted resulting in a 12" thickness of subgrade preparation. Compaction shall be Type A as specified in Subsection 2.09. If the subgrade is unstable after this compactive effort, it shall be re-excavated to a depth of 6" and a 6" Aggregate Base - Type AB-3 placed and compacted as specified in Subsection 3.12, or Flowable Fill as specified in Subsection 5.09, shall be placed below the concrete base course.

ii. <u>Reinforced Concrete Base.</u> A base of 7" reinforced concrete pavement shall be constructed on the prepared subgrade. The pavement surface shall be sloped to match the desired slope of the final brick surface. Reinforced concrete pavement shall be constructed as specified in Subsection 5.05 except for the following:

- The requirement for a 10 foot straightedge shall be waived should the area be too small for its application.
- Texturing is not required.
- At the Contractor's option, Contraction joints may be tooled rather than sawcut.
- Joints shall be sealed with Hot Type joint sealant material as specified in Section 5.05.
- Transverse contraction joints shall be constructed at intervals of 1.5 times the pavement width or at 14 foot maximum intervals, whichever is less.

iii. <u>Sand Leveling Base.</u> Following curing of the concrete, an uncompacted leveling base of FA-A, non-plastic, clean sand shall be screeded over the concrete base course to a thickness of 1" to 1 1/2". The bricks are expected to settle 1/4" to 1/2" after compaction.

iv. <u>Laying Pavers.</u> Brick pavers shall be laid to follow the brick pattern of adjacent pavement with generally the same spacing between bricks as the adjacent bricks.

Where new brick surfaces are being constructed and there are no adjacent brick surfaces, the brick shall be laid in a non-diagonal Herringbone pattern. As the bricks are laid they shall be moved back and forth to solidly bed them into the sand leveling base.

When it is necessary to cut bricks, cutting shall be performed to leave a clean edge to the traffic surface. Bricks shall be cut with either a block splitter or a masonry saw. Excess bricks shall be salvaged to the City.

Once the bricks are in place, sand shall be placed over the area and worked into the joints between the bricks with a broom, leaving a thin sand layer 1/8" to 1/4" thick over the brick surface. A vibratory plate compaction shall be applied to the brick surface. The compactor shall be a plate type soil compactor capable of 3,500 to 5,000 lb. centrifugal compaction force. Additional passes of the vibratory plate compactor shall be made over the area while additional sand is simultaneously brushed into the joints until the sand is even with the top of the bricks.

The brick surface shall then be watered while additional sand is applied on the surface and broomed into the joints. A thin layer (1/4" maximum) of sand shall be left over the brick surface. All other excess sand shall be removed from the site.

After 30 days, or another period of time as determined by the Engineer, sand shall again be applied to the surface and broomed and watered into the joints. Excess sand shall be removed from the site.

Removal of bricks, salvage of bricks, imported bricks, subgrade preparation, reinforced concrete pavement, aggregate base, sand and water shall be subsidiary to the bid items, "Brick Street" and "Brick Alley".

(3) <u>Brick Sidewalks.</u> The Contractor shall preserve, replace or install brick sidewalks in compliance with the requirements set forth in DT-022. Where brick sidewalks cross residential or commercial entrances, or alleys, the entrances and alleys shall be constructed of standard materials meeting the normal requirements for entrances and alleys as required by the Standard Specifications.

Brick sidewalk shall be constructed by excavating to the required depth, preparing the subgrade by scarifying to a depth of 6 inches and compacting the subgrade to the requirements of Type AB compaction as defined in Subsection 2.09. Aggregate Base – Type AB-3 material shall be placed on the subgrade, compacted and trimmed to result in a 4" thickness of aggregate base – all as specified in Subsection 3.12. Clean FA-A sand, as defined in Subsection 5.01, shall be screeded over the aggregate to establish a uniform 1" thick setting bed. Bricks shall be laid following the procedures specified in Subsection 4.05 D.2.iv.

Removal, salvage, and cleaning of existing brick, subgrade preparation, aggregate base, sand, water, and imported bricks shall not be paid for directly, but shall be subsidiary to the bid item, "Brick Sidewalk."

(4) <u>Brick Pavement Adjacent to Concrete Curb and Gutter.</u> Concrete curbs and combined concrete curb and gutter shall be repaired or replaced as specified in Subsections 5.05 and

5.08. Re-laid bricks shall be laid to abut the new concrete curb and gutter curbs in compliance with the requirements set forth in Standard Detail DT-022 or as otherwise detailed in the Project Documents.

(5) <u>Brick Pavement adjacent to Stone Curbs.</u> On brick streets where existing or newly installed stone curbs are constructed, brick pavers abutting stone curbs shall be installed in compliance with the requirements set forth in Standard Drawing DT-022 or as otherwise detailed in the Project Documents.

(6) <u>Preservation and Replacement of Existing Stone Curbs.</u> Any existing stone curbs within the public right-of-way that require removal shall either be salvaged to the City or reset upon restoration of the street. This includes stone curbs that are eligible for replacement with standard concrete curbs or curb and gutter.

i. <u>Removal and Salvage of Stone Curbs.</u> The Contractor or utility company shall notify the City Street Maintenance Section of their intention to remove stone curbs and receive authorization for the removal prior to disturbing any stone curb. The curb stones in good condition shall be removed, salvaged and inventoried. The Contractor or utility company shall adhere to the following requirements when salvaging stone curbs:

- (1) No metal tools, equipment, or implements shall be used to pry, loosen, move or lift the curb stones unless the attachments are protected to prevent damage to the stone.
- (2) All marks of any kind imposed by the Contractor or utility company on the curb stone's exposed face or top shall be removed by soft cloth, nylon brush and water.
- (3) All earth shall be hand-water-washed from the curb stone.
- (4) All mortar shall be hand removed by wooden or hard, rubberized tools.
- (5) Salvaged stones not used in restoration shall be neatly stacked on pallets, and transported to a location designated by the Street Maintenance Section.
- (6) Stones shall be secured to prevent theft or damage until the stones are reset or transported to the City.

ii. <u>Stone Curbs and Resetting Stone Curbs.</u> Stone curbs that are reset or new stone curbs shall be constructed in compliance with the requirements set forth in Standard Drawing DT-022. When stone curbs are to be reset from materials removed from the site and the existing stones are weathered or damaged to such an extent that they should not be reset, they shall be replaced with stone of similar kind and dimensions or with pre-cast concrete curbs manufactured to match the existing stones color, texture, dimensions, and characteristics. Prior to the pre-cast curbs being delivered to the site, the Contractor or utility company shall provide a single pre-cast curb segment/block for the Engineer's review and approval.

The concrete base, compacted asphalt millings, crushed rock, any replacement stones, or any precast concrete curb shall be subsidiary to "Reset Stone Curb" or "Stone Curb."

iii. <u>Stone Curbs (Concrete).</u> When the Project Documents indicate that stone curb is to be removed and replaced with a cast in place colored and textured concrete curb, or when a new cast in place colored and textured concrete curb is to be constructed, the new concrete curb shall meet the requirements set forth in Standard Drawing DT-022. The concrete used for the curb shall meet the requirements for Pavement Class A Concrete as specified in Subsection 5.01. Where removal of an existing stone curb is required, this work shall be subsidiary to "Stone Curb (Concrete)".

(7) <u>Crosswalks on Brick Streets.</u> Where a Crosswalk provides access by sidewalks, sidewalk ramps that meet ADAAG or current applicable guidelines must be provided at both ends of the crosswalk.

i. On brick street surfaces, the installation of colored and textured pavement may be used to enhance the aesthetics of the crosswalks. Alternative surface construction applications will be considered by the Engineer.

ii. Any alternative crosswalk material must be approved by the Director of Public Works and application must be completed by an appropriately trained city personnel or licensed contractor. Installation shall be as per the manufacturer's specifications and methods.

E. Bid Items, Measurement and Payment.

(1) Bid Items:

BRICK STREET	Unit: Square Yard (nearest S.Y.)	
BRICK ALLEY	Unit: Square Yard (nearest S.Y.)	
BRICK SIDEWALK	Unit: Square Foot (nearest S.F.)	
RESET STONE CURB	Unit: Linear Feet (nearest foot)	
STONE CURB	Unit: Linear Feet (nearest foot)	
STONE CURB (CONCRETE)	Unit: Linear Feet (nearest foot)	

(2) <u>Measurement.</u> Measurement for "Brick Street" and "Brick Alley" shall be by the square yard for the total area of brick pavement removed and replaced or constructed. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square yard for each pay application.

Measurement for "Brick Sidewalk" shall be by the square foot for the total area of brick sidewalk removed and replaced or constructed. Dimensions of individual areas shall be

measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square foot for each pay application.

Measurement for "Reset Stone Curb", "Stone Curb", and "Stone Curb (Concrete)" shall be along the face of the curb in linear feet. Measurement of individual curb segments will be made to the nearest 0.1 foot and the segment lengths summed and rounded to the nearest foot for each pay application.

(3) <u>Payment.</u> The amount of completed and accepted brick pavement or stone curb, measured as stated above, shall be made at the Contract unit price per each specific type of pavement or curb removed and replaced or constructed, which payment shall be full compensation for materials, labor, tools, equipment and incidentals necessary to complete the work as specified.

4.06 PAVEMENT REMOVAL AND REPLACEMENT FOR EXCAVATIONS.

A. <u>Scope.</u> "Pavements" as used in this Section 4.06 refers to the hard concrete, brick or bituminous surface of highways, streets, alleys, roads, sidewalks, driveways and parking lots.

B. <u>Materials.</u> Except for brick streets, pavements removed for excavations shall be replaced in-kind -- meaning concrete for concrete and asphalt for asphalt. Materials for the replacement of concrete pavements shall be either Pavement Class A or Pavement Class B concrete as determined by the application criterion and meeting the requirements set forth in Subsection 5.01. Asphaltic Concrete shall be as specified in Subsection 7.02. Subgrade Preparation, Subgrade Treatments, and Aggregate Base shall meet the requirements set forth in Subsections 3.10, 3.11, and 3.12, respectively.

Materials for the restoration and preservation of brick streets are specified in Subsection 4.05.

C. Construction Requirements.

(1) <u>Initial Removal of Pavement</u>. When excavations for the installation or repair of utilities or other underground facilities are performed in paved areas, the existing pavement shall initially be removed only to the limits required to permit safe excavations as specified in Subsections 2.02, 2.03, and 2.04.

Concrete and asphalt pavements shall be full depth sawcut at the planned limits of the excavation prior to the removal of pavement. The Contractor shall remove and dispose of the pavement as Specified in Subsection 3.13.

If the excavation encroaches upon stone curbs or streets, alleys or sidewalks in the public right-of-way that have an exposed brick surface or one or more underlying layers of brick, the requirements of Subsection 4.05 and the City of Topeka Brick Street, Alley and Sidewalk Policy shall apply. Upon encountering stone curb or pavement containing bricks, the Contractor shall contact the City Street Maintenance Section and request instruction relative to preservation of the brick. The Contractor shall not proceed with any excavation of pavement containing brick until authorization from the Street Maintenance Section is received.

When pavements containing brick and/or stone curbs require removal for the excavation, the Contractor shall mark the planned limits of the excavation. After the Engineer approves the

limits as marked, the Contractor may proceed with removal of bricks and stone curbs using care to not damage the bricks or stones as specified in Subsection 4.05. The bricks, including those overlain with asphalt shall either be salvaged to the Street Maintenance Section or be used in preserving and restoring the brick pavement as specified in Subsection 4.05.

The Contractor shall all times take careful action to prevent breaking or cracking of the existing pavement beyond the limits of the excavation.

(2) <u>Final Removal of Pavement and Patching</u>. After the utility facility is installed or repaired, and backfilling is completed as specified in Section 2, additional existing pavement shall be carefully removed to provide a minimum shoulder width of 9 inches of undisturbed subgrade on each side of the trench. If the subgrade is unstable, it shall be excavated to a depth determined by the Engineer and backfilled with Aggregate Base – Type AB-3 as specified in Subsection 3.12.

Asphalt pavements shall be full depth sawcut to neat lines at locations which will result in the specified minimum 9-inch subgrade shoulder. The width from sawcut to sawcut shall be filled with asphalt (referred to in the following as "the patch") matching the thickness of the adjacent pavement minus the final overlay and as specified in Standard Detail Drawing DT-007, DT-008 and Section 7. Pavements consisting of an asphalt overlay on concrete shall be replaced in kind as specified in Standard Detail Drawing DT-007, DT-008 and Subsection 7.04.

Concrete pavements shall be full depth sawcut, removed and replaced to the limits of the full panels that have been partially disturbed unless otherwise directed by the Engineer. The entire width from sawcut to sawcut shall be replaced with concrete as specified in Standard Detail Drawing DT-007, DT-008 and Subsection 5.08

Brick pavements shall have additional pavers removed to provide the specified 9-inch minimum subgrade shoulder. Following the establishment of the subgrade shoulder, brick pavements and stone curbs shall be restored as specified in Subsection 4.05.

(3) <u>Finishing Asphalt Patching</u>. The area surrounding the full depth repair area (the patch) shall be milled to a depth of 2 inches. Final mill and overlay limits shall be perpendicular to the centerline of the roadway unless approved otherwise by the Engineer

i. <u>Asphalt Pavements Less Than Three Years Old.</u> When the existing asphalt pavement is less than three years old, the area milled shall surround the patch to the width of the affected lane in the transverse direction and at least 10 feet in longitudinal directions with at least 1 foot of milled surface surrounding all squared edges of the patch. If the milled area, as described above, extends into the adjacent lane, then the entire adjacent lane width shall also be milled. If the distance between two milled areas is closer than 20 feet, then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than 3 repair areas in a 100 foot section of street, then the areas shall be combined into one large mill and overlay area. The requirements set forth in this paragraph also apply to asphalt on concrete pavements that have an asphalt surface course less than three years old.

ii. <u>Asphalt Pavements More Than Three Years Old.</u> When the existing asphalt pavement is more than 3 years old, the area milled shall extend 1 foot beyond each squared edge of the patch. If the squared edge of patch is within three feet of the gutter toe, then the milled area shall be extended to the gutter toe. If the distance between two milled areas is closer than 10 feet then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than 3 repair areas in a 50 foot section of street, then the areas shall be combined into one large mill and overlay area.

Where pavement markings are removed or disturbed, the Contractor shall replace the markings in kind, meeting the requirements of Subsection 4.23.

Should the Contractor's construction activities damage any pavement surface, whether new or existing, the damaged pavement shall be repaired and/or full concrete panels removed and replaced at the Contractor's sole expense.

D. Bid Items, Measurement, and Payment.

(1) <u>Bid Items:</u>

REMOVE AND REPLACE (*) " CONCRETE PAVEMENT Unit: Lineal Feet (nearest foot)

REMOVE AND REPLACE 2" ASPHALT ON (*) " CONCRETEPAVEMENTUnit: Lineal Feet (nearest foot)

REMOVE AND REPLACE BRICK PAVEMENT

Unit: Linear Feet (nearest foot)

REMOVE AND REPLACE (*)" **ASPHALTIC CONCRETE PAVEMENT** Unit: Linear Feet (nearest foot)

REMOVE AND REPLACE (*)" CONCRETE (@) Unit: Linear Feet (nearest foot)

REMOVE AND REPLACE (*) " ASPHALTIC CONCRETE (@) Unit: Linear Feet (nearest foot)

REMOVE AND REPLACE (*) " **CONCRETE SIDEWALK** Unit: Square Feet (nearest square foot)

REMOVE AND REPLACE CURB AND GUTTER

Unit: Linear Feet (nearest foot)

(*) - Pavement Thickness

(@) - Parking Area or Driveway

(2) <u>Measurement.</u> Measurement for "Remove and Replace (*)" Concrete Pavement", "Remove and Replace 2" Asphalt on (*) " Concrete Pavement", "Remove and Replace Brick Pavement", "Remove And Replace (*)" Asphaltic Concrete Pavement", "Remove and Replace (*)" Concrete (<u>@</u>)", and "Remove and Replace (*)" Asphaltic Concrete (<u>@</u>)" shall be by the linear foot, to the nearest foot, along the center line of the excavation for the total area of paving removed and replaced, regardless of width of paving removed.

Measurement For "Remove and Replace <u>(*)</u>" Concrete Sidewalk" shall be by the square foot for the total area of sidewalk removed and replaced. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square foot.

Measurement for "Remove and Replace Curb and Gutter" shall be along the face of the curb in lineal feet regardless of the type of curb and gutter. Measurement of individual curb segments will be made to the nearest 0.1 foot and the segment lengths summed and rounded to the nearest foot for each pay application.

(3) <u>Payment.</u> The amount of completed and accepted pavement, measured as stated above, shall be made at the Contract unit price bid for each specific type of pavement removed and placed, which payment shall be full compensation for all cutting, breaking, sawing, removal of existing pavement, placement of new pavement at the specified thickness, finishing, curing, and protection as specified and all materials, equipment, labor, tools and incidentals necessary to complete the work.

4.07 CRUSHED ROCK SURFACING

A. <u>Materials.</u> Crushed Rock Surfacing material shall conform to the requirements of Aggregate Base AB-3 specified in Section 3.12 or to ³/₄-inch Asphalt Stone with the following gradation :

Sieve Size	Percent Retained
3/4"	0
1/2"	25
3/8"	52
#4	93
#8	97
#100	97
#200	98

Projects within City Limits Only – When AB-3 is specified for temporary surfacing of access roads, or on driveways, parking areas or pedestrian walkways, it shall be gray in color unless otherwise indicated in the Project Documents.

The surfacing material shall be delivered to the project fully mixed to a uniform condition with moisture content at or above optimum.

B. <u>Construction Requirements.</u> Where the aggregate surfacing of existing traveled ways has been disturbed by construction or construction equipment, the Contractor shall resurface the disturbed area with four inches of crushed rock or as otherwise directed by the Project Documents or the Engineer. Crushed rock surfacing shall also be used for temporary surfacing of access roads, on driveways, parking areas or pedestrian walkways as indicated in the Project Documents or as directed by the Engineer.

The surfacing shall be spread and rolled until a dense and tight surface is obtained. Water shall be applied to the surfacing, as determined by the Engineer, until the project is accepted for maintenance by the City or County.

C. Bid Item, Measurement, and Payment.

(1) <u>Bid Item</u>:

CRUSHED ROCK SURFACING

Unit: Ton (nearest 0.1 Ton)

(2) <u>Measurement.</u> "Crushed Rock Surfacing" shall be measured by the ton as provided by load tickets. Measurement shall be to the nearest 0.1 ton.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per Ton for "Crushed Rock Surfacing", which payment shall be full compensation for all excavation, crushing, mixing with water, furnishing, hauling, placing, and maintaining the materials as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

4.08 CLEARING AND GRUBBING

A. <u>General</u>. This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the construction limits shown on the Project Drawings or other trees as may be indicated in the Project Documents. Disposal of all materials shall be accomplished as specified in Subsection 3.13.

B. <u>Construction Requirements.</u> Trees designated on the Drawings "To Be Removed" and other trees, hedges, brush, and shrubs which are wholly within the excavation areas shall be removed to a minimum depth of 2 feet below the ground surface and disposed of as approved by the Engineer.

Where hedges and trees have limbs and branches which overhang and interfere with the construction, these limbs and branches may be trimmed by sawing and coating the cut with an approved pruning sealer, or they may be removed with the written approval of the property owner and Engineer.

Trees, shrubs, and other vegetation specifically indicated in the Project Documents to be saved or protected shall not be removed and shall be protected from the Contractor's construction activities to the extent necessary to prevent damage thereto.

C. Bid Items, Measurement and Payment.

(1) Bid Items.

CLEARING AND GRUBBING

Unit: Lump Sum

REMOVE LARGE TREES

Unit: Each

(2) <u>Measurement.</u> Clearing and grubbing and the removal of trees shall not be measured or paid for directly, but shall be subsidiary to other items of the Contract unless "Clearing and Grubbing" or "Remove Large Trees" are listed as pay items in the Project Documents.

When "Clearing and Grubbing" is listed as a pay item in the Project Documents the clearing and grubbing work shall be measured by the lump sum. The removal of all trees and stumps, regardless of size, shall be incidental to "Clearing and Grubbing" unless "Remove Large Trees" is included as a pay item in the Project Documents.

When "Remove Large Trees" is included as a pay item in the Project Documents, the removal of those trees which measure 40 inches or more in circumference at a point 2 feet above the natural ground level, and/or stumps of the same circumference measured 1 foot above natural ground level, or at the top of the stump if it does not extend to that elevation, shall be measured per each tree of such size removed.

When "Remove Large Trees" is included as a pay item in the Project Documents, the removal of those trees which measure less than 40 inches in circumference shall be incidental to "Clearing and Grubbing" or subsidiary to other items of the Contract if "Clearing and Grubbing" is not included as a pay item in the Contract Documents.

(3) <u>Payment.</u> When listed in the Project Documents as a pay item, "Clearing and Grubbing" shall be paid for at the Contract lump sum price for "Clearing and Grubbing." Payment shall be full compensation for all felling, grubbing, root removal, grinding, and disposal as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

When "Remove Large Trees" is listed in the Project Documents as a pay item, the amount of completed and accepted tree removal work, measured as provided above, shall be paid for at the Contract unit price **per each** for "Remove Large Trees". Payment shall be full compensation for all felling, grubbing, root removal, grinding, and disposal as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

4.09 REMOVAL OF EXISTING STRUCTURES

A. <u>General.</u> The Contractor shall remove and dispose of existing structures as specified in the Project Documents. Existing structures include the structures identified in the Project Documents for removal, and man-made structures not specifically identified in the Project Documents which are in conflict with the new construction and apparent upon a careful examination of the work site and normally encountered in similar work.

(1) <u>Salvaged Materials.</u> The Contractor shall remove, clean, and store on the project site at locations determined by the Engineer any materials designated for salvage. If the transporting of salvaged materials is included as a part of the work specified in the Project Documents, the Contractor shall transport salvaged material to the designated offsite location(s) and stockpile the salvaged material as approved by the Engineer. Materials designated to be salvaged will remain the property of the Owner. Unless otherwise shown in the Project Documents, the Contractor shall salvage and clean all existing pipes determined usable by the Engineer.

B. Materials.

(1) <u>Backfill Material.</u> The Contractor shall backfill cavities created by the removal of existing structures using granular material or loose friable soil from the project. Backfill material shall be free of excess moisture, frozen lumps, roots, sod, clods and rocks greater

than 3 inches in diameter, or any other deleterious material. The Engineer will accept the backfill material based on visual inspection.

(2) <u>Flowable Fill</u>. Flowable Fill used to backfill storm sewers and culverts, if approved by the Engineer, shall meet the requirements of Subsection 5.09.

C. Construction Requirements.

(1) <u>General.</u> The Contractor shall remove and dispose of all existing man-made structures and debris located within the project limits and not designated to remain. If the substructure of an existing structure lies wholly or partly within the limits of a new structure, the existing substructure shall be removed to accommodate the new structure. Existing structures shall be removed to 12 inches below the natural ground surface or new finished lines, whichever is lower. At streambed locations, existing structures shall be removed to the natural stream bottom.

Unless the area is to be excavated during the new construction, the Contractor shall backfill and compact all cavities left by the removal of structures. Compaction shall be completed as the backfilling progresses. Backfilling and compaction shall be completed to the level of the surrounding ground.

If the backfill area is within the limits of the new construction, the Contractor shall compact the backfill to the requirements of the type of compaction designated for the area in the Contract Documents.

(2) <u>Storm Sewers and Culverts.</u> Existing storm sewers and culverts to be abandoned after completion of the project shall be removed and the resulting cavity backfilled. With the Engineer's approval, the Contractor may fill abandoned sewers or culverts with flowable fill in lieu of removal. Filling of abandoned sewers or culverts shall be accomplished by blocking off the ends of the remaining segments and filling from an opening created in the top of the culvert or sewer at the high end of the segment to remain. Other means of filling abandoned sewers or culverts may be used if approved by the Engineer. This work and material shall not be paid for separately but shall be subsidiary to "Removal of Existing Structures." Any portion of an abandoned culvert or storm sewer that is within 12 inches of the finished ground line or top of subgrade shall be removed.

(3) <u>Public Property.</u> Removal of highway markers, posts, guard fence, standards or other similar obstructions shall be coordinated with the KDOT Area 4 Utilities Coordinator. With approval from KDOT, these items shall be removed and properly stored and reset by the Contractor as determined by the Engineer.

All City owned street signs and traffic signs in conflict with the project and not in use shall be removed by the Contractor, transported to the City storage facility, and stockpiled as directed by the Engineer. Traffic signing will be reset by the Contractor unless removal and replacement of permanent traffic control signs is designated in the Project Documents as work to be performed by City of Topeka Transportation Operations Division. All county owned street signs and traffic signs shall be removed by the Contractor and stored onsite for pickup by the Shawnee County Public Works Department.

The covering of existing traffic control signing that is in conflict with the temporary traffic control for the project is the responsibility of the Contractor.

- D. Bid Item, Measurement, and Payment.
 - (1) <u>Bid Item:</u>

REMOVAL OF EXISTING STRUCTURES Unit: Lump Sum

(2) <u>Measurement.</u> The removal of existing structures as specified shall not be measured or paid for directly, but shall subsidiary to other items of the Contract unless "Removal of Existing Structures" is listed as a pay item in the Project Documents.

When "Removal of Existing Structures" is listed as a pay item in the Project Documents, the work shall be measured by the lump sum.

(3) <u>Payment.</u> When listed in the Project Documents as a pay item, "Removal of Existing Structures" shall be paid for at the Contract lump sum price for "Removal of Existing Structures" which payment shall be full compensation for all removal, backfilling, and compaction as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

4.10 MAILBOXES.

A. Materials. All materials utilized shall meet the requirements of the US Postal Service.

B. <u>Construction Requirements.</u> It is the Contractor's responsibility to coordinate construction activities with the U.S. Postal Service and to complete the work in such a manner that mail service is not interrupted during the course of the project. The Contractor shall carefully remove any mailbox interfering with construction and shall reset it in good condition in accordance with U. S. Postal Regulation P.O.D. Form 4056 as soon as practical after the completion of construction activities in the area and minimize inconvenience to residents, businesses, and the U.S. Postal Service.

To provide for continuous and convenient mail service, the Contractor shall temporarily set any mailboxes removed to a location accessible for delivery of mail as determined by the US Postal Service. Temporary mailboxes shall be considered subsidiary to other items of the contract.

Mailboxes and their supports damaged by the Contractor shall be replaced with equivalent new material and set at no additional cost to the Owner or landowner.

- C. Bid Item, Measurement, and Payment.
 - (1) <u>Bid Item:</u>

MAILBOX REMOVED AND RESET

Unit: Each

(2) <u>Measurement.</u> The removal and resetting of mailboxes shall be measured per each mailbox removed from its pre-construction location and reset at a final permanent location. Resetting of mailboxes in temporary locations or installing temporary mailboxes shall not be measured or paid for directly, but shall be shall be subsidiary to other items of the Contract.

(3) <u>Payment.</u> Payment for the completed and accepted removal and resetting of mailboxes, measured as described above, shall be at the Contract unit price for "Mailbox Removed and Reset", which payment shall be full compensation for the work as specified and for all equipment, tools, labor, and incidentals necessary to complete the work.

4.11 REMOVE AND RESET CULVERTS AND END SECTIONS

A. <u>Construction Requirements.</u> Existing Culverts and/or End Sections that are designated in the Project Documents to be removed and reset shall be carefully removed, cleaned, and reset at the locations indicated in the Contract Documents or indicated by the Engineer. Resetting of the culverts and end sections shall meet the construction requirements for storm sewer installation in Subsection 6.03.

Culverts, end sections, or pipes found not salvageable due to deterioration or damage not the fault of the Contractor, shall be replaced with new Reinforced Concrete Pipe or Aluminized Steel Type 2 Corrugated Steel Pipe conforming to the requirements of Subsection 6.03. The size of pipe installed shall be the size removed or as directed by the Engineer. When new culverts, end sections or pipes are installed, measurement and payment shall be as provided for in Subsection 6.03.

B. Bid Items, Measurement, and Payment.

(1) <u>Bid Items.</u>

REMOVE AND RESET (*)" CULVERT (Type)	Unit: Lineal Foot (nearest L.F.)
REMOVE AND RESET (*)" END SECTION (RCP)	Unit: Each
REMOVE AND RESET (*)" X (*)" CULVERT (Typ	De#) Unit: Lineal Foot (nearest L.F.)
REMOVE AND RESET (*)" X (*)" END SECTION	(Type#) Unit: Each
(*) - inside diameter of pipe Type - (CMP) corrugated metal pipe or (RCP) reinfo	rced concrete pipe

Type - (CMP) corrugated metal pipe or (RCP) reinforced concrete pipe Type # - (RCPHE) for reinforced concrete pipe horizontal elliptical or (CMPA) for corrugated metal pipe arch.

(2) <u>Measurement</u>. The removal and resetting of pipes shall be measured by the linear foot, to the nearest foot, from end of pipe to end of pipe, excluding any portion of an end section, for each combination of inside pipe diameter and type of pipe.

The removal and resetting of pipe end sections shall be measured per each end section removed and reset for each combination of inside pipe diameter and type of pipe.

(3) <u>Payment.</u> Payment for "Remove and Reset (*) inch Culvert (Type)" and "Remove and Reset (*) inch x (*) inch Culvert (Type #)" shall be made at the Contract unit price per linear foot for each combination of inside pipe diameter and type of pipe removed, reset, and accepted, which payment shall be full compensation for all removal, excavation, placing, backfilling and compaction as specified, and the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

Payment for "Remove and Reset (*) inch End Section (Type)" and "Remove and Reset (*) inch x (*) inch End Section (Type #)" shall be made at the Contract unit price per each combination of inside pipe diameter and type of end section removed, reset, and accepted, which payment shall be full compensation for all removal, excavation, placing, backfilling, and compaction as specified, and the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

4.12 RIPRAP.

A. Materials.

(1) <u>Aggregate.</u> Stone riprap shall be pit run limestone or dolomite meeting the quality and product control requirements for "Stone for Riprap" in Section 1114 of the KDOT Standard Specifications. When approved by the Engineer or stated in the Project Documents, broken concrete may be used in lieu of limestone or dolomite, provided the concrete is free of all wire mesh and steel. The classes of riprap are defined as follows:

i. Class I shall have a maximum size of 100 pounds (1.0 foot dia.) and a minimum size of 12 pounds (0.5 foot dia.).

ii. Class II shall have a maximum size of 700 pounds (2.0 feet dia.) and a minimum size of 25 pounds (0.7 foot dia.).

iii. Class III shall have a maximum size of 2,000 pounds (3.0 feet dia.) and a minimum size of 40 pounds (0.8 foot dia.).

(2) <u>Filter Fabric</u>. Filter fabric shall be a pervious sheet of nonwoven needle punched fabric. Weight of fabric shall be at least 6.0 ounces per square yard. The water flow rate shall be approximately 110 gallons per minute per square foot. Fabric shall have a minimum puncture resistance of 100 pounds and be resistant to freeze-thaw cycles, soil chemicals and ultraviolet light exposure.

B. <u>Construction Requirements.</u> Riprap shall be installed in accordance with the details on the Standard Drawings DT-015 and DT-016. Riprap shall be placed over filter fabric when fabric is called for on the Project Drawings. Sheets of fabric shall be overlapped a minimum of 18 inches.

C. Bid Items, Measurement, and Payment.

(1) <u>Bid Items:</u>

CLASS (*) STONE RIPRAP

Unit: Square Yard (nearest S.Y.)

CLASS (*) BROKEN CONCRETE RIPRAP Unit: Square Yard (nearest S.Y.)

(*) – Class I, II, or III

(2) <u>Measurement.</u> Each of the various classes and types of riprap shall be measured by the square yard in place. Individual areas of stone riprap shall be determined by measuring the slope dimensions of the riprapped area to the nearest 0.1 foot, computing individual areas square feet, summing the areas, converting the total three dimensional area of the plane of the riprap's surface to square yards and rounding to the nearest square yard for each pay application.

(3) <u>Payment.</u> The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per square yard for "Class (*) Stone Riprap" and "Class (*) Broken Concrete Riprap" for each class of riprap, which payment shall be full compensation for all excavation, crushing, furnishing, hauling, placing, spreading and maintaining the materials as specified, and for all equipment, tools, labor, and incidentals necessary to complete the work.

4.13 UNDERDRAINS

A. <u>General.</u> The Contractor shall construct an underdrain system to the lines, grades and requirements specified in the Project Documents.

B. Materials.

(1) <u>Aggregate.</u> Underdrain aggregate shall conform to the requirements of BD-1 as specified in Section 1107.2 (d) of the KDOT Standard Specifications or an approved equal.

(2) <u>Underdrain Pipe.</u> Underdrain pipe (outside of roadway) shall be perforated polyethylene pipe complying with AASHTO M252 or polyvinyl chloride pipe complying with AASHTO M278. Underdrain pipe (under roadway) shall be perforated polyethylene or polyvinyl chloride pipe having a minimum pipe stiffness value of **46** psi at 5% deflection.

(3) <u>Geotextile Fabric</u>. Geotextile fabric shall meet the requirements of Section 2210 of the KDOT Standard Specifications.

C. <u>Construction Requirements.</u> The Contractor shall construct an underdrain system that will collect and transport subsurface water from under the roadway. The perforated underdrain pipe shall have a minimum diameter of 4 inches and shall be laid on a minimum grade of 1%, unless shown otherwise in the Project Documents. Underdrain pipe shall be non-perforated within 5 feet of connection to an inlet. The minimum trench width shall be 8 inches plus the exterior diameter of the underdrain pipe. The Contractor shall not backfill the underdrain system prior to the Engineer's approval. The trench shall be backfilled with underdrain aggregate and enveloped with geotextile fabric to within one foot of finished grade or as shown on the plans. Trenching, backfilling, aggregate, fitting and outlet appurtenances, and filter fabric are incidental to the underdrain system.

D. Bid Item, Measurement, and Payment.

(1) <u>Bid Item:</u>

UNDERDRAINS

Unit: Lineal Feet (nearest Ft.)

(2) <u>Measurement.</u> Underdrains shall be measured by the slope lengths of pipe installed. Measurement will be to the nearest foot.

(3) <u>Payment.</u> Completed and accepted underdrains, measured as provided for above, shall be paid for at the Contract unit price for "Underdrains", which payment shall be full compensation for all materials, trenching, backfilling, placing, pipes, joining, aggregate, fitting and outlet appurtenances, and filter fabric, and all labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.14 GUARDRAIL AND GUIDEPOSTS

A. <u>Materials.</u> Guardrail and guidepost materials shall meet the requirements of Section 827, Division 1600, Division 1800, and Division 2300 of the KDOT Standard Specifications except as follows:

(1) <u>Basis of Acceptance</u>. The Engineer shall accept the materials based upon visual inspection of the materials, manufacturer's certifications that the materials meet the requirements of the specifications, catalog cuts, and/or shop drawings submitted by the Contractor.

B. <u>Construction Requirements.</u> The Contractor shall construct guardrail and install guideposts at the locations shown in the Project Documents. Guardrail and guidepost construction and installation shall meet the requirements of Section 827 of the KDOT Standard Specifications.

C. <u>Bid Items, Measurement, and Payment.</u> The bid items, measurement, and payment for guardrail and guideposts shall be as set forth in Section 827 of the KDOT Standard Specifications and as shown in the Contract Documents.

4.15 CHAIN LINK FENCE.

A. <u>General.</u> Chain link fence shall be installed in locations shown in the Project Documents as marked in the field by the Engineer. Fence shall consist of galvanized or aluminum coated steel fabric, with top rail and bottom tension wire, and with fabric heights as indicated in the Project Documents. Posts shall be set in concrete or on galvanized steel base plates as shown in the Project Documents.

B. <u>Materials.</u> All steel or malleable iron parts and accessories shall be hot-dip galvanized or aluminum coated after fabrication.

(1) Fabric shall be 9 gauge, 2-inch mesh; galvanized, ASTM A392, Class 2, or aluminum coated, ASTM A491; knuckled selvage on top, twist selvage on bottom.

(2) Bottom Tension Wire shall be 7 gauge, galvanized or aluminum coated coil spring wire.

(3) Stretcher Bars shall be steel, ASTM F626, 3/16 inch by 3/4 inch, or equivalent area.

(4) Fabric Ties shall be aluminum bands or wires, ASTM F626.

(5) Concrete for post foundations shall be Structure Class as defined in Section 5.01.

(6) Post caps may be aluminum or galvanized steel.

Type of Post	6 foot fence		4 foot fence	
	O.D.	Weight per Ft.	O.D.	Weight per Ft.
Line post	2 3/8"	3.11 lb.	1 7/8"	2.72 lb.
Corner or pull post	2 7/8"	4.64 lb.	2 3/8"	3.65 lb.
Top rail & bracing	1 5/8	2.27 lb.	1 5/8"	2.27 lb.
Gate post	4"	9.10 lb	2 7/8"	5.79 lb.
Gate frame	1 7/8"	2.72 lb.	1 7/8"	2.72 lb.
Vehicle gate post	6 5/8"	18.97 lb.	4"	9.10 lb.

(7) Posts: Minimum post sizes shall be as listed below:

C. <u>Construction Requirements.</u>

(1) <u>Gates.</u> Gate frames shall be constructed of galvanized pipe of the size and weight shown above and to the dimensions shown on the Drawings. Frames shall be welded at all joints to provide watertight construction or the pipe shall be connected with watertight heavy malleable iron corner fittings. All weld-damaged areas shall be painted with zinc rich paint. All gates shall be equipped with approved hinges, latches, stops, locking devices and satisfactory fittings for padlocking. The same type and weight of fabric shall be used in the gate as is used in the fence in which the gate will be installed. Hinges shall be heavy pattern with large bearing surfaces and shall not twist or turn under the action of the gate. The length of pedestrian and vehicular gates shall be as shown in the Project Documents.

2) <u>Fence Construction.</u> Posts shall be set plumb, spaced approximately 10 feet apart. Posts set in earth shall be provided with concrete foundations 36 inches deep. Foundations for line posts shall be 10 inches in diameter. For terminal and gateposts, the foundations shall be the post OD plus 9 inches in diameter. Foundations shall extend 1 inch above the ground surface and be crowned. Concrete shall cure for 72 hours before additional work is done on the posts.

Where posts are set in rock, post excavation shall be continued to the 36-inch depth or 18 inches into the rock, whichever is less. Diameter of foundations in rock shall be a minimum of 6 inches larger than the OD of the post.

Top rails and bottom tension wires shall be installed before the fabric. Top rails shall be securely connected to gate and terminal posts.

Tension wires shall be attached to each post and securely anchored at terminal and gateposts. Tension wires shall be stretched taut and anchored so that a perpendicular horizontal pull of 150 lbs. at the middle of a panel will not move the tension wire more than 3 inches from its original position.

Fabric shall be attached to top rail and bottom tension wire on 24-inch centers, and to the line posts on 15-inch centers. Stretcher bars shall be provided at each gate and terminal post. Each stretcher bar shall be threaded through the fabric and anchored to the post at 15 inch centers by positive mechanical means.

Each gate and terminal post shall be braced by a horizontal pipe brace and an adjustable truss extending to an adjacent line post. Corner posts shall be braced in both directions.

Fabric shall be stretched taut and anchored so that a pull of 150 pounds at the middle of a panel will not move the fabric more than 3 inches from its original position.

Completed fence shall conform to the alignment and finish grade indicated in the Project Documents. Ground surface shall be graded as required to maintain no more than a 2-inch clearance below the bottom of the fence fabric.

- D. Bid Items, Measurement, and Payment.
 - (1) <u>Bid Items:</u>

(*) FOOT CHAIN LINK FENCE	Unit: Lineal Feet (nearest Ft.	
(*) FOOT PEDESTRIAN GATE	Unit: Each	
(*) FOOT VEHICULAR GATE	Unit: Each	

(*) Height of fence in feet

(2) <u>Measurement.</u> The various heights of fence installed shall be measured to the nearest foot along the slope of the fence at the top rail and excluding gates. Gates shall be measured per each installed.

(3) <u>Payment.</u> The amount of completed and accepted fence, measured as provided above shall be paid for at the Contract unit price per linear foot for "(*) Foot Chain Link Fence" of the various heights specified. Completed and accepted gates, measured as provided above, shall be paid for at the Contract Unit Price for "(*) Foot Pedestrian Gate" and "(*) Foot Vehicular Gate per each gate of the various heights specified. Payment shall be full compensation for furnishing and erecting all materials, for all clearing, excavation, embankment, concrete footings, and for all labor tools, equipment and incidentals necessary to complete the work as specified.

4.16 FIELD OFFICE

A. <u>General</u>. When specified in the Project Documents, a Field Office or Field Office and Laboratory shall be provided at the job site meeting the requirements for the specified type as shown in Section 803, Field Office and Laboratory, KDOT Standard Specifications.

(1) <u>Field Office.</u> The Field Office will be set up and maintained by Contractor for the exclusive use of the Project Field Representative at a location designated by the Project Field Representative. Field Office shall remain in place until project is accepted (final). All weather access shall be provided with approved temporary surfacing material. Placement and removal of temporary surfacing is subsiding to bid item, Field Office. Sanitary facilities and high speed internet service shall be supplied with Field Office for the duration of the project at contractor's expense.

- B. Bid Items, Measurement and Payment.
 - (1) <u>Bid Items:</u>

FIELD OFFICE

Unit: Each

Unit: Each

(*) Type: A, B, or C.

(2) <u>Measurement.</u> Measurement will be made per each Field Office and per each of the various types of Field Office and Laboratory provided.

(3) <u>Payment.</u> Partial payments will be made at specified intervals during the project -40% of the Contract unit price after the unit is installed and accepted, 70% after 3 months of use, and 100% at the completion of the Project and release by the Engineer. Said payments shall be full compensation shall for providing and installing the field office, and for all materials, labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.17 MONUMENT BOX.

A. <u>Materials.</u> Monument box castings shall be **Cover No. 2193-01-1003 and Ring No. 2093-01-2050 Clay and Bailey Manufacturing Co., (these may also be approved equal, but must be compatible with each other) with the utility designation omitted from the lid. A concrete support ring that is compatible with the casting shall be supplied with each monument box.**

B. <u>Construction Requirements.</u> Monument boxes shall be installed at the locations shown in the Project Documents and/or marked in the field by the Engineer or Project Surveyor. Installation shall be as depicted in the Project Drawings with the top cover and ring set true to the line and slopes of the finished surface or pavement. If an existing monument box is located at the location shown in the Project Documents for a new monument box installation, the Contractor shall notify the Engineer and request a determination from the Engineer regarding the need for removal and replacement. Castings of old monument boxes replaced shall be salvaged to the Owner at no additional cost.

The Contractor shall be responsible for coordinating the installation of monument boxes with the Engineer or Project Surveyor. The Contractor shall also be responsible for any traffic control necessary for monument box installation unless otherwise stated in the Project Documents.

The Contractor shall carefully protect all monuments and benchmarks of the City, County, State or Federal government from disturbance or injury and shall not excavate nearer than 5 feet to any monument or benchmark without permission of the Engineer or Project Surveyor, or until the monuments and/or benchmarks have been removed, witnessed or otherwise disposed of by the Project Surveyor.

C. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

MONUMENT BOX

Unit: Each

(2) <u>Measurement.</u> Measurement of Monument Boxes shall be per each installed.

(3) <u>Payment.</u> Installed and accepted Monument Boxes shall be paid for at the Contract unit price per each "Monument Box", which payment shall be full compensation for salvaging and removing the existing monument box casting, and furnishing all materials,

labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

4.18 CONTRACTOR CONSTRUCTION STAKING.

A. <u>General.</u> Contractor Construction Staking shall consist of establishing the project centerline, referencing or re-referencing all control points, running a level circuit to check or re-establish plan benchmarks, setting additional benchmarks as needed, staking right-of-way, and performing all construction layout and reference staking necessary for the proper control and construction of the Project.

B. <u>Contractor's Survey Personnel</u>. Before performing any surveying operations on the Project, the Contractor shall inform the Engineer of the personnel responsible for land surveying, construction surveying, and staking. The Contractor's personnel performing the construction staking shall work under the direct supervision of engineering or surveying personnel trained and experienced in construction staking and layout of the types necessary for the construction of the Project and shall be acceptable to the Engineer. The Contractor's personnel shall work under the direct supervision of a Land Surveyor licensed by the Kansas State Board of Technical Professions when performing land surveys, setting section corners, and setting permanent points on the right-of way lines.

C. <u>Construction Requirements.</u> The Contractor shall be responsible for fulfilling the duties of the "Project Surveyor" as defined in Subsection 1.12.

All stakes, reference points, lines, grades, control points, and batter boards required for the construction operations shall be furnished, set, and properly referenced by the Contractor in a manner consistent with standard engineering practices. The Contractor shall be solely responsible for the accuracy of the line and grade of all features of the work. Any errors, omissions, or discrepancies found in previous surveys or in any of the Project Documentation shall be immediately brought to the attention of the Engineer for correction or interpretation prior to proceeding with the work.

Field notes shall be kept in bound field notebooks and shall be presentable in a neat, clear, and orderly manner consistent with standard engineering practices. The Contractor shall allow the Engineer to review the field notes immediately upon the Engineer's request.

The Contractor is responsible for any deficiencies or inaccuracies in the Work which may be the result of inaccuracies, errors or omissions in the construction staking or layout.

(1) Equipment and staking tolerances.

i. <u>Slope Staking</u>. Horizontal and Vertical tolerance of ± 0.10 feet. Use a GPS system, a Total Station, or a Level & Transit.

ii. <u>Finish Staking and Structures</u>. Horizontal = ± 0.05 feet; Vertical = ± 0.01 feet. For Horizontal, use a GPS system or a Total Station. For Vertical, use a Level. The tolerances apply to grade hubs and string lines.

iii. <u>Critical Bridge Member Staking</u>. Horizontal = ± 0.02 feet; Vertical = ± 0.01 feet. For Horizontal, use a GPS system or a Total Station. For Vertical, use a Level.

iv. <u>Land Surveying.</u> Comply with the Kansas Minimum Standards for Boundary Surveys. Use a GPS system or Total Station.

v. <u>Project Control Points.</u> The relative precision of any project control point \pm 0.05 feet from the project coordinate data. Use a GPS system or Total Station.

- D. Bid Item, Measurement and Payment.
 - (1) <u>Bid Item:</u>

CONTRACTOR CONSTRUCTION STAKING Unit: Lump Sum

(2) Measurement. "Contractor Construction Staking" shall be measured by the Lump Sum.

(3) <u>Payment.</u> Contractor Construction Staking shall be paid for on a lump sum basis, which payment shall be full compensation for all personnel, engineering equipment, supplies, materials filing fees, and transportation, and for all labor, equipment, tools and incidentals necessary to complete the work as specified. Partial payment will be made as follows:

Percent of Original Project Contract	Percent of Contractor Construction Staking
Amount Completed	That May Be Paid.
Work Started	25%
5%	40%
25%	60%
50%	80%
70%	90%
100%	100%

4.19 FINISHING DISTURBED AREAS.

A. <u>General</u>. The rates of seed, fertilizer, and water applications required by this Subsection 4.19 are minimums, and the Contractor shall be solely responsible for the establishment of 70% grass coverage of all unpaved or otherwise uncovered areas of soil within the limits of the Project. Additional labor, materials, equipment and incidentals to establish the 70% coverage shall be subsidiary to the pay items "Seeding and Fertilizing" and/or "Sodding".

All unpaved areas within the construction limits shall be seeded or sodded, fertilized and mulched. Mulching may be deleted with the approval of the Engineer.

The finishing of disturb areas, either with temporary erosion and water pollution control measures, permanent sodding, or permanent seeding shall be completed as the work progresses and as soon as grading of a particular area of the work is completed regardless of the number of sub-contractor mobilizations involved. The Contractor's work sequence shall allow for the finishing of disturbed area to be completed in a timely manner which limits exposure to erosion.

All areas which have been disturbed by the Contractor during construction shall be graded and shaped to the grades shown on the Drawings, and shall be finished with 4 inches of topsoil to be provided by the Contractor and approved by the Engineer. Topsoil may be either material selected from the site or imported material.
Paved streets and other paved areas shall be cleaned. Mud, trash, and debris in streets shall not be washed into storm sewer systems or waterways. This work shall be subsidiary to other items of the Contract unless listed as a pay item.

B. <u>Materials.</u> Seeds and Fertilizers shall be delivered to the site in convenient waterproof containers. Each container shall be fully labeled and bear the name, trade name, or trade mark of the producer. Each container shall also bear a warranty from the producer.

(1) <u>Topsoil.</u> Topsoil is defined in Subsection 3.03.

(2) <u>Seeds.</u> Seed shall comply with the seed and noxious weed laws of the State of Kansas. Seed containers shall bear the producer's certificate of the percentage of the purity and germination of each kind of seed specified.

(3) <u>Sod.</u> Sod shall be a Tall Turf Fescue/Bluegrass Blend (90% / 10%) unless otherwise specified. The sod shall be cut in strips not less than 18 inches wide and of uniform thickness with a topsoil thickness of $\frac{1}{4}$ inch to $\frac{1}{2}$ inch. Badly torn, broken or dry sod will not be accepted. Sod containing noxious weeds or excessive quantities of foreign grass will not be accepted.

(4) Fertilizer.

i. <u>Seeded Areas.</u> Fertilizer for seeded areas shall be inorganic 15-30-15 grade, uniform in composition, free flowing and suitable for application with approved equipment or shall be an approved substitute. The Contractor shall request approval of substitute materials prior to the material being delivered to the site.

ii. <u>Sodded Areas.</u> Fertilizer shall be inorganic 12-12-12 grade, uniform in composition, free flowing and suitable for application with approved equipment.

(5) <u>Mulch.</u> Mulch shall be straw or hay delivered to the site in bales meeting the North America Weed Free Forage Standards. Prairie hay is the preferred mulch.

(6) <u>Mulch Tacking Slurry</u>. Mulch tacking slurry shall be used only where approved by the Engineer. Tacking materials and/or tacking agents that are toxic to vegetation, hazardous to the germination of seed, may stain concrete or other surfaces, or may be injurious to personnel handling and applying the materials shall not be used or accepted. Mulch tacking material shall comply with the following:

- A blend of fibers of recycled slick paper containing wood cellulose, and kaolin clay
- Free of synthetic or plastic materials or other foreign material
- Biodegradable
- Disperses in water and forms a homogeneous slurry, and remains in suspension when agitated by hydraulic slurry equipment
- When sprayed uniformly over the mulch, forms an absorbent cover allowing percolation of water in the underlying soil
- Packaged in moisture resistant bags with the net weight (mass) of the packaged material plainly shown on each bag
- Non-water soluble fibers

Mulch tacking Slurry shall comply with the following minimum requirements for wood cellulose mulch:

Applied Color	Green
Organic Matter, percent by weight	Min. 80
Tacking Agents, percent by weight	>4
Moisture Content, percent by weight	12 ± 3
Water Holding Capacity >1200 grams of H ₂ O per 100 gram	ns of fiber
pH Range	$.5 \pm 3$

Guar Gum based tacking agent shall be added to the tacking material in the hydraulic slurry at a rate and manner recommended by the manufacturer. The tacking agent must be biodegradable and comply with following:

Density	30 grams per cc
Hazardous Components	None
Percent Volatile	0 at 70°F
Appearance C	Cream Colored Powder
Water Miscibility	Thickener
Odor	Mild

C. Construction Requirements.

(1) Seeding, Fertilizing and Mulching.

i. <u>Equipment.</u> The seeding operation shall be accomplished with equipment suitable for preparing the seed bed and sowing the seed and fertilizer in accordance with the applicable requirements of these Standard Specifications.
ii. <u>Preparation of the Seed Bed.</u> Areas to be seeded shall be cleared and graded as required preparatory to tilling the surface. The top 4 inches shall consist of good quality black topsoil sufficiently free of stones, gravel, trash, large lumps of earth, and ruts to permit normal mowing with hand equipment. Residual soil not suitable for the germination of seeds and the growth of grass, as determined by the Engineer's visual inspection, shall be replaced with suitable topsoil.

iii. <u>Application of Fertilizer</u>. Following the proper tilling of the soil, the fertilizer shall be distributed uniformly at the rate of 100 pounds per acre and incorporated into the soil to a depth of at least 2 inches by disking, harrowing or drilling methods.

iv. <u>Planting Seeds.</u> The seed shall be uniformly planted by a seed drill unless otherwise approved. The Contractor shall use a drill that can apply commercial grass seed and wildflower seed, or a drill with attachments that would allow the application of fertilizer and grass seeds at the rate and depth specified. The drill must be approved by the Engineer. The width of the drill will be approved on the basis of the area to be seeded. The space of seed-tubes, disks and boots shall be a maximum of 8 inches. Drills shall accurately control the depth of seeding and fertilizer placement to a maximum depth of ½ inch. The drill's seed and fertilizer compartments shall have partitions to prevent the seed or fertilizer from sliding to one side of the drill while operating on steep slopes.

A seed mixture and suggested rates of application are listed below. The Contractor shall be responsible for adapting the seed mixture and rate of application to the site conditions so as to insure a uniform stand of healthy grass with a density of 70% coverage within 12 months from the date of project acceptance and in reasonable conformity with adjacent areas. Seed mixtures and rates, if different from those given herein, shall be approved by the Engineer.

Seed Type and Rate of Application

Seed Type	Rate of Application (PLS lbs/acre)		
Kentucky Blue Grass Seed	65		
Tall Turf Fescue	348		

v. <u>Seeding Season</u>. The Spring Seeding Season shall be between February 15th and April 30th. The Fall Seeding Season shall be between August 15th and September 30th. These seeding seasons may be extended with the approval of the Engineer. The Engineer reserves the right to vary the seeding seasons shown above due to weather or soil conditions or for other causes.

vi. <u>Compaction</u>. Immediately following the completion of seeding operations, the entire area shall be compacted with a roller weighing not less than 60 but not more than 90 pounds per linear foot of roller.

vii. <u>Hydro-seeding</u>. On steep slopes or other areas inaccessible with a seed drill or broadcast seeder, a hydro-seeder may be used when approved by the Engineer. Apply the seed-fertilizer-water slurry within 1 hour after the seed is added to the hydro-seeder tank. Apply seed evenly over the entire site. Use a fan-type nozzle with approximately 500 gallons of water per acre. Add 75 pounds of hydro-mulch per 500 gallons of water for a visual tracer. After the seeding, but before mulching, hand rake the seeded areas inaccessible by a cultipacker. Immediately apply bonded fiber matrix hydromulching as specified herein. Hydro-seeding shall be considered "Seeding" and no adjustment shall be made to the unit prices or measured quantities due to the Contractor's election to use hydro-seeding materials and methods to accomplish the work.

viii. <u>Mulching</u>. Straw or hay mulch shall be applied uniformly to seeded areas at the rate of not less than two (2) tons per acre. Baled straw or hay shall be broken up and loosened sufficiently before being fed into the blower hopper to avoid the placing of matted or unbroken clumps. The use of wet straw or hay is prohibited.

Mulching shall be performed within 24 hours after seeding, but shall not be performed when wind speeds are greater than 15 mph or when it is raining. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of steep slopes, and shall continue until the area is covered. The mulch shall be applied loose enough to allow sunlight to penetrate and air to circulate, but thick enough to partially shade the ground, reduce water evaporation, and reduce wind and water erosion. Immediately after applying the mulch, the Contractor shall anchor it to the soil using a mulch crimper/puncher or other approved equipment with perpendicular, dull, disc blades. This process to partially cover the mulch will protect it from erosion by wind or water. The mulch tilling operation shall be performed parallel to the ground contours.

In areas where slopes are too steep for use of a mulch crimper/puncher, the Contractor shall "pat" the mulch with forks as it is placed on the slope.

To reduce wind loss, cover the mulch on the upper $\frac{1}{3}$ of slope by hand spreading a light application of soil or sand on the mulch. If in the opinion of the Engineer these methods do not result in proper anchoring of the mulch, the Contractor may be required to provide additional anchorage of the mulch by the application of a mulch tacking slurry at no additional cost to the Owner.

(1) <u>Hydro-mulching</u>. The Contractor may elect to apply bonded fiber matrix mulch in lieu of straw or hay if approved by the Engineer. The Contractor shall use a test area to demonstrate to the Engineer's satisfaction and approval that the Contractor's hydro-mulching equipment and methods will result in the desired results of controlling erosion and establishing grass.

The bonded fiber matrix shall be mixed at the rate of 5 pounds per 10 gallons of water and apply the bonded fiber matrix at the rate of (dry) 3,500 pounds per acre of seeded and compacted slope, immediately after the seeding and compaction to maximize adhesion and minimize slumping. The Contractor shall obtain complete coverage from a consistent angle of approach while applying bonded fiber matrix with no less than 65% coverage from the primary angle of application, and 35% coverage from the secondary angle of coverage. Maintain secondary angles of coverage of between 175° and 185° from the primary angle.

Hydro-mulching shall be considered "Mulching" and no adjustment shall be made to the unit prices or measured quantities due to the Contractor's election to use hydro-mulch materials and methods to accomplish the work.

ix. <u>Watering</u>. Immediately following compaction and mulching, the seeded area shall be watered in sufficient amount to penetrate the seed bed to a depth of at least ¹/₄ inch. The seed bed shall not be allowed to dry out. Watering shall be performed in a manner not to cause erosion or damage to the seeded surface, and shall be repeated daily for a period of thirty (30) days after seeding, except when thoroughly wetted by rain.

(2) Sodding.

i. <u>Preparation of the Sod Bed.</u> The sod bed shall have a uniform surface free from washes, depressions, rocks, clods, ruts and other vegetation and shall conform to the finished grade and cross section shown on the Drawings. The soil, except where fresh topsoil has just been applied and compacted, shall be thoroughly tilled to a

depth of 2 inches, and rolled with a roller weighing not less than 60 and not more than 90 pounds per linear foot of roller.

ii. <u>Fertilizing.</u> After tilling operations are completed, fertilizer shall be spread uniformly at the rate of 7 pounds per 1,000 square feet (Note: Projects outside City limits shall use 3 pounds per 1,000 square feet), and mixed 2 inches deep into the soil by disking, harrowing, cultivating or drilling.

iii. <u>Placing Sod.</u> Tall Turf Fescue/Bluegrass Blend sod shall not be placed during drought conditions nor during the period from June 15th to September 1st, unless authorized by the Engineer, and shall not be placed on frozen ground. Zoysia sod shall be placed only during the period from May 15th to August 15th. The sod shall be moist when it is placed. Dry or frozen sod will not be accepted.

The fertilized sod beds shall be in a firm but not overly compacted condition, with a relatively fine texture at the time of sodding. Transverse joints between sod strips shall be staggered. The sod shall be carefully placed to produce tight joints. The sod shall be firmed, watered, and refirmed immediately after it is placed. "Firming" shall be accomplished by rolling the newly placed sod with a roller weighing not less than 60 or more than 90 pounds per linear foot of roller.

When sod is to be placed on slopes 2:1 or steeper, the sod shall be pegged with $\frac{1}{2}$ inch by 12 inch wooden pegs driven into the ground on about 3 foot centers, leaving about 1- $\frac{1}{2}$ inch of the peg above the sod. Pegging shall be done immediately after the sod is firmed.

iv. <u>Watering</u>. The sodded area shall be thoroughly watered daily, for a period of not less than 21 days after placing. Any portion of sod that is not in good growing condition shall be replaced with fresh live sod and shall be maintained in good live condition until final acceptance of the turf.

D. <u>Basis of Acceptance</u>. The Engineer shall review the density of the grass coverage and the condition of the turf for a period of 12 months following the Contractor's Application for Final Payment. If at any time during this 12 - month period, any portion of the seeded or sodded surface becomes gullied or otherwise damaged or eroded, or the seeding is damaged or destroyed, or the seed has not germinated sufficiently to establish the required grass coverage, the affected area shall be repaired, reworked, and re-seeded or re-sodded as necessary to establish the specified conditions. The Engineer shall make a final inspection of the turf at the end of the 12 month period. The Contractor shall correct any deficiencies identified at the inspection.

At the end of the 12 - month period and following the correction of deficiencies, if all unpaved areas within the Project limits have 70% grass coverage the Contractor shall be released from further responsibility for the seeding or sodding. If at the end of the 12 - month period areas still exist that have less than 70% grass coverage, the Contractor, at no additional cost to the Owner, shall continue to rework, re-seed and or re-sod deficient areas until the required coverage is attained.

(1) <u>Final Payment and Acceptance.</u> During the period erosion and pollution control measures are still required and grass coverage is being established, if the Work of the Project is otherwise complete, the Engineer will make recommendation for Final Payment and present the Final Application for Payment to the Owner conditional to the requirements of Article 14 Paragraph 14.13 of Document 700 General Conditions. However, the work specified in Subsections 4.19 and 4.20 of these Standard Specifications is specifically

identified as requiring the Contractor's Continuing Obligations as defined in Article 14 Paragraph 14.15 of Document 700 General Conditions.

After Final Application for Payment is submitted by the Contractor, the maintenance, replacement, and installation of any erosion control devices or measures necessary to prevent erosion while the required grass coverage is being established shall no longer be paid for directly but shall be completed at the sole expense of the Contractor. The Contractor shall provide work zone traffic control for any seeding or erosion control work completed during this period at no additional cost to the Owner.

(2) <u>Cost of Corrective Actions</u>. If the Contractor fails to initiate measures to correct deficiencies to the seeding and/or erosion control measures during and/or at the end of the 12- month period within 7 calendar days of notice that deficiencies have been identified, then the seeding, fertilizing and mulching shall be considered defective work and the conditions of Article 13 of Document 700 General Conditions shall apply.

E. Bid Items, Measurement, and Payment.

(1) Bid Items:

SEEDING, FERTILIZING AND MULCHING Unit: Acre (nearest 0.1 Ac.)

SODDING

Unit: Square Yard (nearest S.Y.)

(2) <u>Measurement.</u> The area receiving "Seeding, Fertilizing and Mulching" shall be computed using the trapezoidal method with the horizontal dimensions measured to the nearest foot. The horizontal area of individual trapezoids shall be summed, converted to Acres, and rounded to the nearest 0.1 Acre for each pay application.

Areas receiving "Sodding" shall be computed using the trapezoidal method with the horizontal dimensions measured to the nearest foot. The horizontal area of individual trapezoids shall be summed, converted to square yards, and rounded to the nearest square yard for each pay application.

Alternatively, if acceptable to both the Engineer and the Contractor, the above areas may be measured by traversing the perimeters of the disturbed areas with a handheld or other GPS device, downloading the perimeter points to a computer, and computing the area utilizing either CAD or coordinate geometry.

(3) <u>Payment.</u> The amount of completed and accepted seeding, fertilizing and mulching measured as provided above shall be paid for at the Contract unit price per acre for "Seeding, Fertilizing and Mulching". Completed sodding, measured as provided above, shall be paid for at the Contract unit price per square yard for "Sodding". Said payments shall be full compensation for preparation of the ground, furnishing and planting all seeds and sods, fertilizing, compacting, watering, and staking, and for all labor tools, equipment and incidentals necessary to complete the work as specified.

4.20 TEMPORARY EROSION AND POLLUTION CONTROL

A. <u>General.</u> The Contractor shall take all necessary measures to prevent erosion on the project and pollution of any drainage course. Any earth moving activity shall minimize the amount of exposed soil and maintain as much vegetative cover as possible. Erosion and pollution control measures shall include berms, ditch checks, silt fence, sediment basins, inlet sediment barriers, temporary seeding, and erosion control blankets, **and shall meet the requirements of the State Of Kansas Stormwater Runoff from Construction Activities General Permit No. S-MCST-0312-1.**

B. <u>Regulatory Requirements.</u> A project or construction activity disturbing any size area of soil will require an erosion control plan to be implemented to prevent soil loss and other pollutants from entering any storm water system.

Owners or operators of any construction project which will disturb one (1) or more acres must receive an "Authorization to Discharge Stormwater Runoff from Construction Activities In accordance with the Kansas Water Pollution Control General Permit Under the National Pollutant Discharge Elimination System (NPDES)" from the Kansas Department of Health and Environment (KDHE). Construction shall not start until this authorization, referred to herein as the "NPDES general permit", is received.

Application for the NPDES general permit is made by submitting a "Notice of Intent for Discharge of Stormwater Runoff from Construction Activities" (NOI) and the required supporting documentation and fees to KDHE at least 60 days prior to the scheduled start of construction. A primary requirement for receiving the NPDES general permit is that a Stormwater Pollution Prevention Plan (SWPPP) is designed and implemented. Upon authorization of the construction activity KDHE will provide the Permittee a signed copy of the first page of the NOI with the indication of KDHE authorization and the Kansas and Federal permit numbers added. This document serves as the NPDES general permit certificate.

On developer projects, the developer is responsible for obtaining the NPDES general permit. On City funded projects, the City will obtain the NPDES general permit. The County will obtain the NPDES general permit on County funded projects.

Upon execution of the Construction Contract Agreement and prior to the issuance of a Start Work Order, the City or County will transfer the permit to the Contractor by submitting a jointly executed copy of a "Notice of Transfer of Owner/Operator" (NOTO) form to KDHE. The Contractor then becomes the "permittee" and assumes all responsibility for adhering to the requirements of the permit. The SWPPP is a part of the Project Documents.

When the soil disturbing activity is completed, all areas are restored, and all requirements of the NPDES permit are complete, then the permittee must submit a Notice of Termination (NOT) form to KDHE to terminate the authorization to discharge. The Engineer will not release the Contractor from the obligation of providing erosion and pollution control and establishing grass in unpaved areas of the Project until KDHE accepts the NOT and a copy of KDHE notice of acceptance is provided to the Engineer. The Contractor shall also not be released from the obligation of providing erosion and pollution control and establishing a stand of grass until the requirements of Subsection 4.19 D. are satisfied.

C. Materials.

(1) <u>Devices.</u> Erosion control devices shall meet the requirements shown on the Standard Detail Drawings, as stipulated in the SWPPP, and as included in the Project Documents.

(2) <u>Seeds.</u> Winter wheat and ryegrass seeds used for temporary seeding shall be delivered to the site in convenient containers. Each container shall be fully labeled and bear the name, trade name, or trade mark of the producer. Seed containers shall also bear the producer's certificate of the percentage of the purity and germination of each kind of seed specified and a warranty from the producer. Seed shall comply with the seed and noxious weed laws of the State of Kansas.

(3) <u>Mulch.</u> Mulch shall be straw or hay delivered to the site in bales meeting the North America Weed Free Forage Standards. Prairie hay is the preferred mulch. Hydro-mulching shall meet the requirements of Paragraph 4.19 B (6).

D. Construction Requirements.

(1) <u>Contractor's Responsibilities.</u> The Contractor shall thoroughly review the SWPPP or erosion control plan in detail. The Contractor shall provide the Engineer and Design Consultant with a written description of any modifications to the SWPPP or erosion control plan. Erosion control devices must be installed to establish a perimeter control of the project in areas where it is anticipated that storm water runoff will leave the project site. The SWPPP or erosion control plan shall cover all areas that the Contractor's work may affect including outside the project limits, disposal sites, haul roads, and nearby bodies of water.

All erosion control devices shall be installed according to the approved SWPPP and the Project Documents. The Contractor shall be responsible for updating the SWPPP or erosion control plan during construction to reflect any changes of erosion control devices which have been installed and not originally included in the SWPPP or erosion control plan.

All disturbed areas with no activity on them for a period of 14 calendar days shall be temporarily seeded and mulched.

Any soil stockpiled for more than 7 calendar days shall have silt fence or another type of sediment barrier placed around it to trap sediment.

(2) <u>Contractor's Schedule.</u> The Contractor shall provide a schedule for implementing the SWPPP or erosion control plan to the Engineer. If the erosion control schedule changes, the Contractor shall notify the Engineer in writing before making the schedule change. The Contractor's work sequence shall allow for erosion control measures to be completed in a timely manner and shall limit exposure to erosion.

Regardless of the number of sub-contractor mobilizations involved, erosion and sediment control measures, permanent sodding, or permanent seeding shall be completed as the work progresses and as soon as grading on a particular area of the work is completed. The temporary erosion and pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to the extent practical, to assure economical, effective and continuous erosion control throughout the construction and post construction period.

Erosion Control shall be established prior to, or simultaneously with, the clearing and grubbing operations. Grading shall not be performed until the erosion control devices are installed and approved by the Engineer.

Temporary or permanent ditches graded on site shall either be stabilized or have temporary sediment control installed immediately after their grading.

(3) <u>Silt Fence and Hay Bales</u>. Either silt fence or hay bales may be used as temporary slope barriers as shown in Standard Drawings DT-021. They shall be placed following the contour of the slopes. Hay bales for slope protection shall be embedded into the soil a minimum of 6 inches and fixed with a 2" x 2" x 4' stake in the **outside 1/3 sections of the bale**. The Contractor shall remove and dispose of the sediment when deposits reach approximately ¹/₂ the height of the bale.

Silt Fence for slope protection shall be installed with the fabric trenched into the ground as shown in the Project Documents. When conditions warrant, the Contractor shall supplement the temporary silt fence with a support fence. The Contractor shall reduce the post spacing and drive the posts further in the ground in low and soft, swampy areas. The Contractor shall remove and dispose of sediment deposits when the deposit approaches $\frac{1}{2}$ the height of the silt fence. Sediment removal at slope barriers is subsidiary to the barrier.

(4) <u>Inlet Protection (Curb or Area).</u> Any soil disturbing activity upstream from an inlet shall require protection at the inlet. The Contractor shall install inlet protection as shown in the Project Documents. When inlets are located in sumps, care shall be taken that flooding does not occur due to blockage of the inlet. Inlet protection devices may be placed in gutters upstream of inlets to collect sediment before it reaches inlets. As an alternative to protecting curb inlets at the front, silt fence may be installed along the soil disturbing activity at the back of curb.

The Contractor shall remove and dispose of sediments when they reach ¹/₂ the height of the devices providing protection. Removal of sediment at inlets is subsidiary to Inlet Protection (Curb or Area).

(5) <u>Temporary Ditch Checks</u>. Ditch Checks shall be constructed of the materials and at the locations shown in the Project Documents or determined by the Engineer. Ditch checks shall extend up ditch slopes a sufficient distance to prevent water from running around the outside edge of the ditch checks. When deposits reach approximately ½ the height of the temporary ditch check, the Contractor shall remove and dispose of the accumulated sediment. Removal of sediment at ditch checks is subsidiary to the ditch check.

(6) <u>Sediment Traps or Basins</u>. Sediment traps or basins shall be constructed as shown in the Project Documents or as determined by the Engineer. Sediment traps are for drainage areas less than 5 acres and contain a section of rock embankment lined with gravel on the upstream face for dewatering. A sediment trap does not include an overflow channel. Sediment basins are for drainage areas greater than 5 acres and include outlet works that will drain or partially drain the basin in one or two days. A sediment basin does include a spillway to pass larger flows.

A sediment basin is required for every 10 acres of drainage area. Basins with a large surface area-to-volume ratio are the most effective. A sediment basin should not be used with an earthen embankment or a rock dam in an area of continuously running water (live streams). A sediment basin should also not be used in areas where failure will prevent the use of public roads or utilities. Routine inspection and maintenance of sediment traps or basins is

essential to their continued effectiveness. They should be inspected after each storm event to ensure proper drainage from the collection pool and to determine any need for structural repairs. Material eroded from earthen embankments or stones moved from rock dams should be replaced immediately.

Before constructing a temporary sediment trap or basin, the Contractor shall clear the area of all vegetation and construct the temporary sediment trap or basin with a wide cross-section and a minimum grade. The Contractor shall remove and dispose of accumulated sediment when deposits reach approximately ½ the depth of the trap or basin as originally excavated. Removal of sediment from sediment traps or basins shall be considered "Sediment Removal".

(7) <u>Erosion Control Blanket.</u> The Contractor shall install erosion control blankets according to the manufacturer's requirements.

(8) <u>Construction Entrances.</u> The Contractor shall construct Construction Entrances of the material and to the lines and grades shown in the Project Documents. Roads shall be kept clean and free of mud, dust, dirt, trash and debris. If the construction site entrance crosses a stream, swale, or other depression, a bridge or culvert must be provided to prevent erosion from unprotected banks. Stone and/or gravel used to stabilize the construction entrance shall be large enough so to not be carried offsite by vehicles. Sharp edged stone shall be avoided to reduce the possibility of puncturing tires. At sites with wash racks at each entrance, sediment traps shall be constructed and maintained for the life of the project.

(9) <u>Temporary Berms.</u> The Contractor shall construct temporary berms to divert storm runoff towards stabilized slopes, temporary slope drains, or sediment traps. Temporary berms shall be constructed to the lines and grades shown in the Project Documents or determined by the Engineer. Temporary berms shall be compacted until no further consolidation is observed by using a dozer track, grader wheel or other equipment approved by the Engineer.

(10) <u>Temporary Seeding and Mulching.</u> Temporary seeding shall consist of 120 lbs. (pls) per acre of winter wheat and 75 lbs. (pls) per acre of ryegrass unless stated otherwise in the SWPPP or other Project Documents. Seed shall be evenly applied with a broadcast seeder, drill, or hydro-seeder over the prepared area. Temporary Mulching shall follow the temporary seeding operation, unless approved otherwise. Temporary Mulching shall meet the construction requirements in Subsection 4.19.C.h).

(11) <u>Dust Control.</u> The Contractor shall take measures to control dust and the movement of wind-borne soil particles from disturbed soil surfaces. Such measures may include disturbing the smallest area possible at any one time, establishing surface stabilization immediately after completion of grading, temporary or permanent seeding and mulching, and sprinkling disturbed areas and haul roads with water. Dust Control is subsidiary to other items of the Contract.

(12) <u>Concrete Washout.</u> The Environmental Protection Agency requires the capture of washout water used in concrete mixer rinse out operations. This slurry contains toxic metals and is corrosive, having a high pH value. Concrete washout water must be collected and retained so that it does not migrate to surface waters or into the ground water. Collection methods can vary from using a chute washout box or bucket on the ready mix

truck, providing a washout pit with an impermeable liner or using a portable washout container. Concrete washout facilities should not be placed within 50 feet of storm drains, open ditches, or water bodies. These facilities should also be inspected daily and after heavy rains to check for leaks or damage. When the facility is filled to over 75 percent capacity, the wash water should be vacuumed off or allowed to evaporate to avoid overflows. Concrete washout water collection is subsidiary to other items of the Contract.

E. <u>Maintenance and Inspections</u>. The Contractor shall maintain the effectiveness and performance of all erosion control devices and measures as long as it is required to properly contain sediment runoff and until both the Notice of Termination is accepted by KDHE and the specified density of permanent grass coverage is present as determined by the Engineer. If erosion and pollution control measures are not implemented and maintained, the Engineer may order that all work on the project shall cease until conditions are brought into compliance. Additionally, the Engineer may order defective erosion control measures immediately corrected or cause the correction to be made by a third party, costs of which shall be paid by Contractor in accordance with Paragraph G below. Failure to implement and/or maintain all or part of the erosion control plan shall not make the City/County or Engineer liable to the Contractor for any work delays.

The Contractor shall perform all inspections and complete all inspection and maintenance reports required by the NPDES general permit. During the construction period, the Contractor shall inspect the erosion and pollution control devices and complete the inspection and maintenance reports every 7 days and within 24 hours of a precipitation event of ½ inch or more. During inactive periods, such as winter shutdowns, inspection of the site condition shall be made at least once a month. The devices shall be monitored at least daily during periods of prolonged rainfall. Corrective action must begin within 48 hours of any deficiencies being found and must be completed within 7 calendar days.

Each of the Contractor's inspection reports shall contain, at a minimum, the name of the Contractor's representative, date of inspection, observations relative to the effectiveness of the erosion and pollution control measures, actions taken or necessary to correct deficiencies, and areas where activities have been completed. The Contractor's site inspection reports shall be maintained onsite with the SWPPP or erosion control plans. Copies of the reports shall be provided to the Engineer at a minimum of once a month with the pay requests.

When the Engineer and the Contractor agree that erosion control is no longer required, 70% of the permanent ground cover is established, and the Notice of Termination has been accepted by KDHE, then the erosion control measures shall be removed by the Contractor. After removing the erosion and pollution control devices, the Contractor shall remove and dispose of any silt accumulations; clean inlets, culverts and storm sewers; and perform any reseeding needed.

When erosion and pollution control devices are installed according to the SWPPP or erosion control plan, or as required by the Engineer and such devices are ineffective because of normal deterioration or functional incapacity, these devices shall be replaced as required or requested by the Engineer. The requirement for the Engineer's approval prior to the replacement of ineffective devices does not release the Contractor from any responsibility for inspection or maintenance or erosion control devices. Payment will be made for replacement of the ineffective devices at the established Contract unit prices. All devices should be reviewed for continued effectiveness prior to determining final quantities and payment since quantities will not be adjusted after Final Payment. No payment will be made for replacing erosion and pollution control devices that become ineffective because of improper installation, lack of maintenance, or the Contractor's failure to pursue timely installation

of permanent erosion control devices according to the Project Documents. Further, no payment shall be made to repair or replace erosion control devices damaged by the negligent or intentional acts of the Contractor.

F. <u>Final Payment and Acceptance.</u> During the period that erosion and pollution control measures are still required and grass coverage is being established, if the Work of the Project is otherwise complete, the Engineer will make recommendation for Final Payment and present the Final Application for Payment to the Owner conditional to the requirements of Document 700, General Conditions of the Project Manual. However, the work specified in Subsections 4.19 and 4.20 of these Standard Specifications is specifically identified as requiring the Contractor's Continuing Obligations as defined in Document 700, General Conditions of the Project Manual.

After Final Application for Payment is submitted by the Contractor, the maintenance, replacement, and installation of any erosion control devices or measures necessary to prevent erosion and/or pollution shall continue to be the Contractors responsibility. However, this work shall not be paid for directly but shall be considered a part of the Contractor's Continuing Obligations as defined in Article 14 Paragraph 14.15 of Document 700 General Conditions. This obligation shall continue until both the specified permanent grass coverage is present as determined by the Engineer, and until the Notice of Termination has been accepted by KDHE.

G. Cost of Corrective Action.

(1) <u>Prior to Final Payment.</u> If the Contractor fails to complete corrective actions to the erosion control measures within 7 calendar days of notice that deficiencies have been identified, then the City/County will deduct from final payment to the Contractor all costs incurred due to the Contractor's failure to establish the specified grass coverage, prevent erosion or pollution at the site, or to prevent or remedy a violation of any term or condition of the NPDES permit, specifically including but not limited to, correction of defective erosion and pollution control devices. All direct, indirect and consequential costs to correct a deficiency will be added together, and a Change Order will be issued incorporating the necessary deductive revisions to the Contract Amount into the Contract Documents.

(2) <u>After Final Payment.</u> If the Contractor fails to initiate measures to correct deficiencies to the erosion control measures during and/or at the end of the 12 month warranty period within 7 calendar days of notice that deficiencies have been identified, then the erosion control shall be considered defective work and the conditions of Article 13 of Document 700 General Conditions shall apply.

H. Bid Items, Measurement and Payment

(1) <u>Bid Items.</u>

SILT FENCE OR HAY BALES	Unit: Lineal Feet (Nearest Ft.)
INLET PROTECTION (CURB)	Unit: Each Inlet
INLET PROTECTION (AREA)	Unit: Each Inlet
DITCH CHECK	Unit: Lineal Feet (Nearest Ft.)

SEDIMENT TRAP OR BASIN SEDIMENT REMOVAL	Unit: Cubic Yard (nearest C.Y.) Unit: Cubic Yard (nearest C.Y.)
EROSION CONTROL BLANKET	Unit: Square Yard (nearest S.Y.)
CONSTRUCTION ENTRANCE	Unit: Each
TEMPORARY BERM	Unit: Lineal Feet (Nearest Ft.)
TEMPORARY SEEDING AND MULCHING	Unit: Acre (nearest 0.1 Acre)

(2) <u>Measurement.</u> "Silt Fence or Hay Bales", "Temporary Berm", and "Ditch Check" shall be measured by the slope distance along the face of the device installed to the nearest foot.

"Inlet Protection (Curb)" and Inlet Protection (Area) will be measured per each inlet protected from sediment as specified. When silt fence or hay bales are placed at the back of curb behind inlets, the hay bales or silt fence shall not be considered "Inlet Protection" but shall be measured as "Silt Fence or Hay Bales".

The areas receiving "Temporary Seeding and Mulching " shall be computed using the trapezoidal method with the horizontal dimensions of individual trapezoids measured to the nearest foot. The horizontal area of individual trapezoids shall be summed, converted to Acres, and rounded to the nearest 0.1 Acre for each pay application. Alternatively, if acceptable to both the Engineer and the Contractor, "Temporary Seeding and Mulching" areas may be measured by traversing the perimeters of the disturbed areas with a handheld or other GPS device, downloading the perimeter points to a computer, and computing the area utilizing either CAD or coordinate geometry.

"Sediment Trap or Basin" shall be measured by the volume of excavation completed to construct the trap or basin(s). "Sediment Removal" shall be measured by the volume of sediment removed from a sediment trap or basin. Sediment removed from inlet protection devices, slope barriers and ditch checks shall not be measured. Measured volumes shall be computed by the average end area method. Trapezoidal end areas and the distance between end areas shall be measured to the nearest 0.1 foot as can be reasonably accomplished with a 100 foot cloth tape and level. The volume in cubic feet, thus computed, shall be converted to cubic yards and rounded to the nearest cubic yard for each pay application.

"Construction Entrance" shall be measured per each entrance installed.

"Erosion Control Blanket" shall be measured by the sloped surface area covered by the material. Overlaps between sheets of the mat and buried edges of the mat shall not be measured. Individual areas of the mat shall be determined by measuring the slope dimensions of the matted area to the nearest 0.1 foot, computing individual areas square feet, summing the areas, converting the slope area of the mat's surface to square yards and rounding to the nearest square yard for each pay application.

(3) <u>Payment.</u> Temporary erosion and pollution control shall be paid for at the Contract unit prices for the items listed and measured as provided for above, which payment shall be full compensation for all grading, removal, disposal, planting seeds, fertilizing, mulching,

erosion control devices, furnishing, staking and maintaining, and for all labor tools, equipment and incidentals necessary to complete the work as specified.

Conditional to the Engineer's approval prior to the Contractor's Application for Final Payment, if an erosion and water pollution control device requires replacement due to normal deterioration or functional incapacity or if additional devices are required, the new item(s) shall be paid for at the Contract unit price established for the particular device or work.

The required maintenance, replacing, and provision for additional erosion and water pollution control devices subsequent to the Contractor's Application for Final Payment shall not be paid for directly but shall be considered a part of the Contractor's Continuing Obligations as defined in Article 14 Paragraph 14.15 of Document 700 General Conditions. This obligation shall continue until both the specified permanent grass coverage is present as determined by the Engineer, and until the Notice of Termination has been accepted by KDHE. The Contractor shall provide work zone traffic control when completing erosion and water pollution control work after the Contractor's Application for Final Payment at no additional cost to the Owner.

4.21 PROJECT SIGN

A. <u>General</u>. When specified in the Project Documents, project signs shall be installed at locations determined by the Engineer.

B. <u>Materials.</u> Materials for Project Signs, and the posts, hardware other incidentals necessary for their erection shall be as specified in the Project Documents.

(1) <u>Projects Located within the City Limits Only</u>. The City will have a yearly contract with one sign vendor to provide a standard "Project Sign Type A" or "Project Sign Type B" at a set price. The Contractor shall order project signs from the City's sign vendor and shall purchase the sign from the vendor at the set price.

C. <u>Construction Requirements.</u> When signs are required, the signs shall be installed prior to any construction activity and maintained by the Contractor throughout construction. Signs shall be removed by the Contractor within two weeks of project completion. The unit price bid by the Contractor for each type of sign shall include the sign (at the set price on projects within the City) plus any additional costs to install, maintain, and remove after project completion.

D. Bid Item, Measurement and Payment.

(1) Bid Item.

PROJECT SIGN TYPE (*)

Unit: Each

(*) Type of Sign: A or B.

(2) <u>Measurement.</u> Projects Signs shall be measured per each sign installed.

(3) <u>Payment.</u> Installed and accepted project signs, measured as provided for above, shall be paid for at the Contract unit price for the various types of "Project Signs (*)", which

payment shall be full compensation for all materials, hardware and erection, labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.22 PAVEMENT MARKINGS.

A. <u>General.</u> The Contractor shall prepare the pavement surface and apply pavement markings of the types and at the locations shown in the Project Documents. Temporary pavement markings and waterborne pavement marking paint are specified in Subsection 4.24.

B. <u>Materials.</u> Pavement marking materials shall be new first run materials. All pavement marking materials shall meet the requirements of Division 2200 of the KDOT Standard Specifications, except as modified in paragraphs (1) and (2) as below:

(1) <u>Basis of Acceptance.</u> The Engineer shall accept the materials based upon visual inspection of the materials, manufacturer's certifications that the materials meet the requirements of the specifications, and catalog cuts submitted by the Contractor.

(2) <u>Testing</u>. After delivery to the site, materials for pavement markings shall not be tested for compliance with the specifications unless testing is necessary to resolve a dispute between the Engineer and the Contractor relative to the acceptability of a material either before or after installation. If testing determines a material does not comply with the specifications, then the Contractor shall be responsible for all costs associated with the testing. If testing determines that the material complies with the specifications, then the Owner shall be responsible for all costs associated with the testing.

C. Construction Requirements.

(1) <u>Equipment.</u> The Contractor shall use equipment designed for the preparation and application of the pavement marking material.

(2) <u>Surface Preparation</u>. On existing pavements, the Contractor shall remove the existing pavement markings according to recommendations of the manufacturer of the new markings.

On aged asphalt pavements, thoroughly remove all dirt, grit, grease, residue of prior pavement markings application (including adhesives or primers that may have been used in their application), and any other foreign matter from the roadway surface prior to the application of the new markings.

On new portland cement concrete pavement and new concrete bridge decks use shot blasting to remove curing compound and laitance from the surfaces to with the pavement markings will be applied.

(3) <u>Alignment.</u> The Contractor shall layout the pavement markings as detailed in the plans. If the plans do not provide details, the Contractor shall submit to the Engineer for approval a layout plan for the pavement markings that complies with the latest adopted edition of the MUTCD.

The Contractor shall provide adequate guide marks - approximately 2" by 12" at approximately 30 to 50 foot intervals – for the application of the markings and review and

approval of the Engineer prior to installing the markings. Markings shall be applied straight and close to the intended alignment without abrupt changes that result in an unacceptable appearance. Lines that deviate laterally from the intended alignment more than 2' in 200' may be rejected.

(4) <u>Application.</u> The Contractor shall provide the Engineer with a copy of the manufacturer's application instructions and apply the markings according to those recommendations. The recommendations regarding pavement and ambient temperatures shall be followed. The Engineer will verify the pavement and ambient temperatures before approving the Contractors start of pavement marking application.

On new asphalt surfaces, permanent marking tapes shall be inlaid in the asphalt. Other permanent markings shall be installed immediately after surface course paving unless approved otherwise by the Engineer in advance.

Pavement markings shall be installed prior to opening a project or lane to traffic, unless otherwise approved by the Engineer. If the pavement markings cannot be installed and thus the roadway would be unmarked overnight, interim removable markings shall be installed and remain until the permanent markings can be installed. The Contractor shall make every effort to remove the interim markings and install the permanent markings within 48 hours. Under no circumstance shall the interim pavement markings be in place for more than 14 days. The interim removable markings shall be removed prior to the installation of the permanent pavement markings.

On new Portland cement concrete, lanes cannot be open until interim or permanent markings are in place. Interim markings cannot be left in place more than 14 days and must be removed when permanent markings are installed.

Lane lines shall be 10' long. Gaps shall be 30' long.

(5) <u>Removal of Unsatisfactory Pavement Markings.</u> Removal and replacement of unsatisfactory pavement markings shall be at the expense of the Contractor. The Contractor shall remove and replace pavement markings that were unsatisfactorily installed and or display evidence of failure of the pavement marking material. The Contractor shall remove and replace newly installed pavement markings that have drag marks, gashes, gouges, foreign covering, discolored area or areas that have failed to solidify, have improper adhesion or thickness.

(6) Installation Tolerances.

i. <u>Deficiency in Specified Lane Line Length/Cycle:</u> Price adjustments shall be made for each 10' lane line or 30' gap that is more than 2-inches longer or shorter than the specified length by allowing only 75% payment for the segment of lane out of tolerance. If a gap is out of the 2" tolerance, the same 75% price adjustment will be applied to the following lane line. If a line or gap is more than 12" longer or shorter than the specified length, the out of tolerance line, or the line following the out of tolerance gap shall, at the discretion of the Engineer, either be corrected by the Contractor or left in place without measurement or payment. Correction of out of tolerance markings may require removal and replacement at the Contractor's expense. For example, if a line specified at 10' line is measured to be 10'-3", the Contractor shall be paid for 75% for the entire 10'. Should a space be 30'-3", the Contractor will be paid for 75% of the 10' line. Penalties will be applied until the markings resume the 10'/30' requirement.

ii. <u>Deficiency in Specified Lane Line Width:</u> Markings shall be the width specified in the Project Document. If markings are more than ½" thinner than specified, at the deficient marking shall either be corrected by an approved method at the expense of the Contractor, or left in place with the deficient segment of the line paid for at 75% of the established unit price. Correction of out of tolerance markings may require removal and replacement at the Contractor's expense.

(7) <u>Temperature Limitations.</u> All permanent markings, except preformed thermoplastic and waterborne traffic line paint, shall be installed when the temperature of both surface and air has reached fifty five (55) degrees Fahrenheit and is rising - or as per the manufacturer's recommendations. Preformed thermoplastic may be installed per manufactures recommendations relative to installation temperatures.

(8) <u>Traffic Control.</u> The Contractor must provide traffic and pedestrian control when applying pavement markings under traffic. All traffic and pedestrian control shall conform to the MUTCD and the Project Documents. All costs for traffic and pedestrian control for pavement marking installation are subsidiary to other items of the Contract unless otherwise specified in the Project Documents.

D. <u>Basis of Acceptance</u>. The Engineer shall review the condition of permanent pavement markings for a period of 12 months following the date of Final Acceptance. If at any time during this 12 month period, any pavement markings, except waterborne paint or temporary markings, that have failed to adhere, developed ragged edges, become poorly visible, or lose significant reflectivity shall be replaced by the Contractor at no expense to the Owner. The Engineer will approve the Contractors Application for Payment for pavement markings at the time of initial acceptable installation. However, repair and replacement of failed or deficient pavement markings, as defined above is specifically identified as a part of the Contractor's Continuing Obligations as defined in Article 14 Paragraph 14.15 of Document 700 General Conditions.

E. <u>Cost of Corrective Actions</u>. Unless restricted by weather conditions, if the Contractor fails to initiate measures to correct pavement marking deficiencies within 7 calendar days of notice that pavement marking deficiencies have been identified, then the pavement markings shall be considered defective work and the conditions of Article 13 of Document 700 General Conditions shall apply.

F. Bid Items, Measurement, and Payment.

(1) <u>Bid Items:</u>

PAVEMENT MARKING (*) (**) (***) Unit: Lineal Foot (nearest 1 Ft.)

PAVEMENT MARKING SYMBOL (*) (WHITE) (****) Unit: Each

- (*) Type of Pavement Marking: Patterned Cold Plastic, Preformed Thermoplastic, Thermoplastic, Epoxy, etc.
- (**) Color: White or Yellow.
- (***) Width: 4", 6", 12", 18", or 24" or other width designated in the Project Documents.

(****) Type of Symbol.

(2) <u>Measurement.</u> The various types, colors, and widths of "Pavement Marking (*) (**) (***)" shall be measured to the nearest foot along the length of each segment installed. The "skipped" portion of broken lines shall not be measured. Double lines shall be measured by the length of material actually installed.

"Pavement Marking Symbol (*) (White) (****)" shall be measured per each symbol of the various type of pavement markings and type of symbols installed.

(3) <u>Payment.</u> The amount of completed and accepted pavement markings, measured as provided above, shall be paid for at the Contract unit prices for the various pavement marking types, colors, and widths. Said payment(s) shall be full compensation for preparation of pavement surfaces, layout and marking, application, and materials, and for all labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.23 REMOVAL OF EXISTING PAVEMENT MARKINGS

A. <u>Construction Requirements.</u> The Contractor shall remove existing pavement markings at the locations shown in the Project Documents, indicated by the Engineer, and/or where the existing markings conflict with either the temporary or permanent traffic control of the Project. The existing pavement markings and symbols shall be removed without damaging the pavement surface. As the work progresses, all material deposited on the pavement as a result of the removal operations shall be removed. When blast cleaning within 10 feet of the traveling public, all residue and dust shall be removed as the work progresses, and the property and persons of traveling public protected from damage or harm due to the blast cleaning. The Contractor shall use methods approved by the Engineer to repair all pavement damaged during the pavement marking removal operations.

B. <u>Bid Items, Measurement and Payment.</u> Removal of existing pavement markings shall not be paid for directly, but shall be subsidiary to other items of the contract unless "Removal of Existing Pavement Markings" is included as a pay item in the Project Documents.

(1) Bid Items.

REMOVAL OF EXISTING PAVEMENT MARKINGS UI

Unit: Lineal Foot (nearest 1 Ft.)

REMOVAL OF EXISTING PAVEMENT MARKING SYMBOL

Unit: Each

(2) <u>Measurement.</u> When "Removal of Existing Pavement Markings" is included as a pay item in the Project Documents, it shall be measured as the length of each line segment removed. Measurement will be to the nearest foot. Removal of existing pavement marking symbols shall be measured per each symbol removed.

(3) <u>Payment.</u> When included as a pay item in the Project Documents, completed and accepted "Removal of Existing Pavement Markings" or "Removal of Existing Pavement Marking Symbol" shall be paid for at its established Contract unit price, which payment shall be full compensation for all labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.24 WORK ZONE TRAFFIC CONTROL.

A. <u>General.</u> Unless otherwise indicated in the Project Documents, the Contractor shall provide, erect, maintain and remove vehicular and pedestrian work zone traffic control throughout the duration of the Project. The size, shape, color and placement of all traffic control devices and appurtenances shall comply with the details shown in the Project Documents, the ADAAG or other applicable accessibility guidelines, and the MUTCD.

B. Materials.

(1) <u>Sign Legends.</u> The size and layout of sign messages or legends shall comply with the latest edition of "Standard Highway Signs and Standard Alphabets for Highway Signs".

(2) <u>Crashworthy Devices.</u> The Contractor shall provide materials as shown in the Project Documents that comply with National Highway Cooperative Research Program (NHCRP) Report 350 or the 2009 AASHTO Manual for Assessing Safety Hardware (MASH 2009)

(3) <u>Reflective Sheeting</u>. Reflective sheeting for work zone traffic control devices shall meet the requirements of Division 2200 of the KDOT Standard Specifications.

(4) <u>Standard Work Zone Signs.</u> Standard Work Zones Signs shall be considered any sign with a standard legend and listed in the MUTCD. A value for speed in a multiple of 5 shall be considered a standard legend. The size of Standard Work Zone Signs shall be as designated in the Project Documents. Signs not included in the Project Documents, but added to the project at the request of the Engineer shall also be considered Standard Work Zone Signs if they have a standard legend and are listed in the MUTCD.

(5) <u>Directional and D-3 Signs.</u> Directional Signs shall be of the size shown in the Project Documents and have the black legend EASTBOUND, WESTBOUND, NORTHBOUND, or SOUTHBOUND on an orange background. D-3 signs shall be black on orange signs fabricated by the Contractor and shall serve as supplemental signs for M-series detour signs. The legend on D-3 signs is the name of the detoured street. The minimum letter height for D-3 and Directional signs shall be 3 inches. The height of a D-3 sign is 9 inches. The Contractor shall determine the length of D-3 signs and shall submit a shop drawing of the legend layout to the Engineer for approval prior to fabrication.

(6) <u>Work Zone Informational Signs</u>. When Work Zone Informational Signs are specifies as a part of the Project, they shall have the project specific legends shown in the Project Documents or determined by the Engineer. Work Zone Informational Signs shall have a minimum letter height of 3 inches and shall be black on orange. The Contractor shall determine the size and legend layout of informational signs and shall submit a shop drawing of the layout to the Engineer for approval prior to fabrication.

(7) <u>Tubular Markers</u>. Tubular Markers shall meet the requirements specified in the Project Documents and comply with NCHRP 350 or MASH 2009.

(8) <u>Portable Channelization Devices</u>. Portable devices for the channelization of work zone traffic shall be 18 inch orange cones, 29 inch to 36 inch reflectorized fluorescent orange cones, reflectorized drums, slimline channelizers, and/or reflectorized vertical panels; all as detailed in the Project Documents and in compliance with NCHRP 350 or MASH 2009.

(9) <u>Flashing or Sequencing Arrow Panels (SAP).</u> When specified, the Contractor shall provide, install and maintain a flashing or sequencing arrow panel capable of being legible for a minimum distance of ¹/₂ mile. The flashing or sequencing arrow panels shall comply with Part VI of the MUTCD. Flashing or sequencing arrow panels shall have a control for lamp intensity, using an automatic solar cell switch, backed by a manual switch and capable of dimming 50% from the rated lamp voltage for nighttime operation. The panel shall provide a flashing rate of lamps between 25 and 40 flashes per minute. The minimum lamp "on time" shall be 50% for the flashing arrow and 25% for the sequential chevron. Arrow panel lamps or lenses shall be recessed, or alternately equipped with a minimum 180° upper hood. The color of light emitted shall be yellow.

(10) <u>Portable Message Board (PMB).</u> When specified, the Contractor shall provide a PMB. The PMB shall comply with Part VI of the MUTCD. The size of each character shown on the PMB panel shall be approximately 18 inches high and 12 inches wide with yellow or orange characters displayed on a black background.

(11) <u>Waterborne Traffic Line Paint</u>. Traffic line paint shall be a sprayed, resinous material that should provide a service life of three to twelve months. The material shall meet the requirements of Section 2215 of the KDOT Standard Specifications. The paint shall be applied at least 0.012 inch thick with glass beads meeting the material requirements and applied as specified in said Section 2215. Waterborne traffic line paint shall be accepted based upon the Engineer's visual inspection of performance and consistency and receipt of manufacturer's certifications that the material meets the requirements specified.

(12) <u>Temporary Pavement Markings</u>. Temporary pavement markings shall provide a service life of four to eight weeks. The material shall meet the requirements of Section 2210 of the KDOT Standard Specifications except as modified herein.

(13) <u>Removable Line Masking Tape.</u> A highly durable, skid resistant, non-reflective black or dark gray, pliant polymer tape designed for temporary obliteration of existing pavement markings. The material shall meet the requirements of Section 2210 of the KDOT Standard Specifications except as modified herein.

(14) <u>Material for Wedges at Edge Drop-offs.</u> Material for Aggregate with a high percentage of fines and cohesive soils are acceptable. The contractor may use other materials if approved in advance by the Engineer. Forming wedges at pavement edge drop-offs shall be suitable for the purpose intended. The Engineer will make final acceptance the material for wedges after satisfactory visual inspection of the material in place. Asphalt millings shall not be used for wedges.

C. <u>Construction Requirements.</u> The safe and satisfactory movement of pedestrian, bicycle, and vehicular traffic through the Project is a high priority and is the responsibility of the Contractor.

The Contractor shall use reasonable and appropriate devices and methods to safeguard the persons and property of the traveling public on roads and sidewalks on which construction work is in progress. Failure of the Engineer to notify the Contractor to maintain such devices or use such methods does not relieve the Contractor of responsibility. The Contractor shall obtain the Engineer's approval before erecting traffic control devices, changing traffic control devices, or removing traffic control devices, except if an emergency situation requires immediate action.

The Contractor shall notify the Owner, Engineer and affected businesses, schools and residents of major traffic control changes affecting the location and path of a roadway and or sidewalk access a minimum of 72 hours in advance of the change. The 72 hours does not include Saturdays, Sunday or holidays.

Signs and other vehicular and pedestrian traffic control devices shall be erected as shown in the Project Documents unless determined otherwise by the Engineer. At all times during the progress or temporary suspension of the work, the Contractor shall provide, erect, remove, relocate, clean, replace and maintain suitable signs, barricades, fences or other necessary traffic control devices and pavement markings shown in the Project Documents.

If traffic control issues come to the attention of the Engineer, the Engineer will notify the Contractor of any required repairs or replacements. It is the Contractor's responsibility to inspect and maintain traffic control devices.

The minimum vehicular lane width shall be 11 feet unless otherwise determined by the Engineer or indicated in the Project Documents.

The Contractor shall perform all work during daylight hours, unless otherwise specified or approved.

When determined necessary and requested by the Engineer, the Contractor shall move any traffic control device from one location to another and re-erect it. The Engineer may require additional traffic control devices or flaggers at any time, or at any place.

When the Project Documents indicate that traffic is to be carried through construction, routing of traffic on a detour is prohibited without written approval from the Engineer.

The City Traffic Engineer will establish work zone speed limits. Reduced speed zones, if any, shall be confined to the immediate vicinity of the work. The spacing and taper rates for the installation of traffic control devices shall be based upon the posted speed of the roadway prior to the start of the Work.

In order to minimize inconvenience for the traveling public and to increase the effectiveness of signs and traffic control devices, the Contractor shall move the traffic control devices ahead as the work allows. For example, suppose the following: A work zone is initially one mile long. Following a weeks' worth of the first half mile of the project is complete. The work zone would then be shortened by moving the advance warning signs ahead and removing the temporary traffic control devised no longer necessary.

When no work is in progress, the Contractor shall remove from the road or completely cover with an opaque, weatherproof material, all devices which are required only when work is actually being performed.

The Contractor may develop an alternate traffic control plan. Such alternate plan requires the approval from the Engineer and Owner and must result in increased benefit to the Owner and or traveling public. Neatly prepared detailed drawings of the alternate traffic control plan must be submitted by the Contractor to the Engineer for review.

On roads closed to through traffic, the Contractor must provide ingress – egress access (including the use of temporary surfacing) for residences and businesses along the road that is closed. Where practical, the Contractor shall park and store all vehicles, equipment, tools and materials off the right-of-way.

When existing pedestrian facilities are disrupted, closed or relocated, the Contractor shall provide temporary accessible pedestrian facilities consistent with the existing facilities.

Work zone signs shall not interfere with pedestrian or bicycle traffic on sidewalks, trails or paths. The minimum width of a pedestrian travel-way shall be four feet unless otherwise determined by the Engineer or indicated in the Project Documents.

The Contractor shall separate pedestrian traffic from the work site activity and vehicular traffic. Unless a reasonable safe route through or adjacent to the work zone that does not involve crossing the roadway can be provided, pedestrians shall be directed by advance signing to cross to the side of the roadway opposite from construction activity. Such advance signing shall be located at intersections unless other locations are indicated in the Project Documents or selected by the Engineer.

(1) <u>Signs.</u> The Contractor shall install signs of the type, and at the locations, shown in the Project Documents. The Contractor shall have utilities located prior to driving sign posts. Signs to be left in place fewer than three days may be mounted one foot above the ground line. Signs left in place for more than three days shall be mounted a minimum of 7 feet above the ground line. If all the conditions of no sidewalks, no pedestrians, and no parking are met, the mounting height may be reduced to five feet. If secondary signs are included, the heights may be reduced by one foot.

(2) <u>Channelization Devices</u>. The Contractor shall install channelization devices of the types, and at the locations, shown in the Project Documents. The Contractor shall continually monitor the condition and position of channelization devices. Any devices damaged or moved shall be replaced and/or reset to the neat lines shown in the Project Documents.

Only fully reflectorized non-metallic drums, tubular markers, slimline channelizers, reflectorized vertical panels or cones shall be used for channelizing vehicular traffic. 18" traffic cones shall only be used during temporary daytime activities where speeds are less than 40 mph. Tubular Markers shall only be used where indicated on the drawings or as approved or directed by the Engineer. When the Project Documents indicate "Channelization Devices" any of the portable channelizers listed herein may be used. However, the different types of Channelizers shall not be intermixed with one another.

(3) <u>Flashing or Sequencing Arrow Panels (SAP)</u>. Where specified, the Contractor shall provide, install and maintain an advance warning flashing or sequencing arrow panel mounted on a portable chassis and operating continuously for the period specified. The

Contractor shall adjust the lamp intensity of the SAP to compensate for daytime and nighttime light conditions.

Any and all relocations of the SAP, as may be requested by the Engineer, shall be subsidiary.

(4) <u>Portable Message Board (PMB)</u>. Where specified, the Contractor shall provide, install and maintain a PMB and operate it continuously for the period specified. The message shall be as provided in the Project Documents or as determined by the Engineer. Any and all relocations of the PMB, or changes to the message as may be requested by the Engineer, shall be subsidiary.

(5) <u>One-Way Traffic and Flaggers.</u> The Contractor shall provide for two-lane traffic on all two-way roadways except when approved by the Engineer or shown in the Project Documents otherwise. Traffic shall be reduced to one-lane two-way traffic only when specifically shown in the Project Documents or when approved by the Engineer 48 hours in advance of the need. When one-lane traffic is required, the Contractor shall provide courteous, competent flaggers that are able to communicate effectively with the traveling public, and appropriate signage shall be provided. Flaggers shall know and observe all requirements for flaggers listed in the MUTCD. Flaggers shall be equipped with hand signaling signs mounted on suitable staffs, (minimum 60 inches as measured from the bottom of the sign) and wearing reflectorized, headgear and an ANSI Type II vest while on duty. The Contractor may use uniformed law enforcement personnel as flaggers in lieu of the above uniformed flaggers. When used as flaggers, law enforcement personnel shall wear their official uniform, badge and vest. Temporary traffic signals may be used in lieu of flaggers, when approved by the Engineer. Continued use will be based upon satisfactory performance of the system to effectively move traffic through the area.

(6) <u>Traffic Signal Adjustments</u>, If existing traffic signals require adjustment or modification to provide for work zone traffic control, they shall be adjusted by City of Topeka Traffic Operations Division personnel. The Contractor shall request the adjustment a minimum of 72 hours in advance of the time the adjustment is needed.

(7) <u>Temporary Traffic Signal Installation</u>. Where indicated in the Project Documents, the Contractor shall install a temporary traffic signal. When sidewalks are present, temporary traffic signal installations must provide for ADAAG compliant pedestrian phasing. The temporary traffic signal shall be installed to the requirements set forth in the Project Documents.

(8) <u>Temporary Pavement Markings.</u> When traffic is carried through construction, the Contractor shall provide and maintain temporary pavement markings as shown in the Project Documents and specified herein. Temporary pavement markings installed by the Contractor that deviate laterally from the intended alignment more than 12 inches shall be removed and replaced to the proper alignment at no additional cost to the Owner.

i. <u>Waterborne Traffic Line Paint</u>. The surface preparation, alignment, and application of waterborne traffic line paint shall be completed as per the Construction Requirements of Section 807.3 of the KDOT Standard Specifications.

ii. <u>Temporary Pavement Markings and Removable Line Masking Tape.</u> The surface preparation, alignment, and application of temporary pavement markings and line masking tape shall be completed as per the Construction Requirements of Section 805.3 (j) of the KDOT Standard Specification. Temporary pavement markings and removable line masking tape shall not be measured or paid for directly but shall be subsidiary to other items of the Contract unless "Pavement Marking (*) (**) (***)" and/or "Removable Line Masking Tape (***)" are included as pay items in the Project Documents. In all cases, removal of temporary pavement markings and removable line masking tape shall not be paid for directly and shall be considered incidental to the Work.

(9) <u>Barricades.</u> The Contractor shall install barricades of the types and at the locations Indicated in the Project Documents or determined by the Engineer.

i. <u>Type III Barricades</u> shall be used for vehicular road and lane closures. A sufficient number of barricades shall be installed to completely close the roadway or lane. Such barricades may be temporarily staggered to allow construction traffic to enter the site but must be close enough to one another to provide unmistakable guidance to the travelling public that the roadway is closed. When approved signs are mounted on Type III barricades, the signs shall not cover more than 50% of the top two rails or 33% of the total area of the three rails.

ii. <u>Type I or Type II Barricades</u> may be used for the mounting of advanced sidewalk closure signs R9-10, R9-11, and R9-11a. These barricades shall be located on or adjacent to the sidewalk, but shall allow at a 48" width of sidewalk to be available for pedestrian use. Other devices that meet the requirements of the MUTCD may be used in lieu of Type I or II Barricades in this application.

iii. <u>Continuous Detectable Barricades Types I, II, III, or Other Types</u> compliant to the MUTCD shall be used at the point of sidewalk closure and adjacent to the sidewalk shoo-fly, if any.

(10) <u>Uneven Lanes.</u> When a height differential exists between adjacent lanes, 36" x 36" W8-11 Uneven Lanes signs shall be installed. A sign shall be placed at the beginning point of the condition and additional signs at approximately 1000 foot intervals along the affected roadway segment. Uneven Lane signs shall be placed in both directions if applicable.

(11) <u>Surface Drop-off Treatment.</u> On projects that carry traffic through construction the Contractor shall provide for the treatment of vertical or near vertical drop-offs from the driving surface to adjacent areas. When such drop offs are not separated by an approved barrier, the Contractor shall utilize the applicable treatment action specified in Table 4.24 C (11).

For unusual and justifiable conditions the Engineer may waive the requirement for the pavement edge wedge. Contractor convenience or the need to remove the wedge material immediately prior to paving are not grounds for the waiving the required pavement edge wedge. Spacing of the channelizing devices (distance in feet between devices) shall be approximately equal to the posted speed limit. In no case shall edge drop-offs greater than 4 inches be unprotected overnight without a wedge or channelizing device. To the extent reasonable, the Contractor shall provide an obstruction free recovery area.

Condition	Action
The drop-off between the edge of driving lane and the adjacent area is 2 inches or less and the adjacent area is not an open driving lane.	No action required
The drop-off between the edge of driving lane and the adjacent area is 2 inches or less and the adjacent area is an open driving lane.	36" x 36" W8-11 Uneven Lanes signs shall be installed as per Section 4.24 C (11).
The drop-off between the edge of the driving lane and adjacent material is between 2 to 4 inches.	Shoulder Drop-off Signs (W8-9A and W7- 3A) shall be installed at the beginning of the condition and at each intersecting roadway. Signs shall be removed or covered when not applicable. Also install channelizers along the pavement's edge with the space between devices feet equal to the posted speed in mph.
The drop-off between the edge of the driving lane and the adjacent material is 4 inches or greater.	Construct a 1:3 or flatter slope wedge (either temporary or permanent, as required) against the pavement edge, using earthen material or other materials approved by the Engineer. Also install channelizers along the pavement's edge with the space between devices feet equal to the posted speed in mph.

TABLE 4.24 C (11): SURFACE DROP-OFF TREATMENT

(12) <u>Weather and Increased Traffic Volume Conditions</u>. During periods of inclement weather, or during periods of unusually heavy traffic, from any cause, the Engineer may require construction operations to cease in order to adequately handle the traffic. The Engineer has the right to require the suspension and / or delay or acceleration of certain operations to obtain a sequence of operations that will aid the movement of traffic.

(13) <u>Work Zone Traffic Control after Contractor's Application for Final Payment.</u> The Contractor shall provide work zone traffic control whenever the Contractor's activities are taking place within the right-of-way. The Contractor may be required to complete certain work, such as the maintenance or removal of erosion and pollution control devices after the Final Application for Payment has been presented to the Owner. If such instances the Contractor shall provide the necessary work zone traffic control at no additional cost to the Owner.

D. Bid Items, Measurement, and Payment

(1) <u>Bid Items.</u>

TRAFFIC CONTROL	Unit: Lump Sum
STANDARD WORK ZONE SIGNS	Unit: Each
WORK ZONE INFORMATIONAL SIGNS	Unit: Each
DIRECTIONAL SIGNS	Unit: Each

D-3 SIGNS	Unit Each
TUBULAR MARKERS	Unit: Each
PORTABLE CHANNELIZATION DEVICES SEQUENCING ARROW PANEL	Unit: Each Unit: Each
PORTABLE MESSAGE BOARD	Unit: Each
TEMPORARY TRAFFIC SIGNAL (#)	Unit: Lump Sum
BARRICADES (TYPE I OR II)	Unit: Each
BARRICADES (TYPE III)	Unit: Each
CONTINUOUS DETECTABLE BARRICADES	Unit: Lineal Feet (nearest 1 Ft.)
TEMPORARY PAVEMENT MARKING (*) (**) (***)	Unit: Lineal Feet (nearest 1 Ft.)
WATERBORNE TRAFFIC LINE PAINT (<u>**) (***)</u>	Unit: Lineal Feet (nearest 1 Ft.)
REMOVABLE LINE MASKING TAPE _(***)_	Unit: Lineal Feet (nearest 1 Ft.)
SURFACE DROP-OFF TREATMENT"	Unit: Lineal Feet (nearest 1 Ft.)
(#) Location of Temporary Signal Installation: e.g.) (SW 6 th & S	W Jackson)

- (*) Type of Pavement Marking: Type I, Type II, or Type IIA.
- (**) Color: White or Yellow.
- (***) Width: 4", 6", 12", 18", or 24" or other width designated in the Project Documents.

(2) <u>Measurement.</u> When "Traffic Control" is included as a pay item in the Project Documents, it shall be measured by the lump sum and no measurement of the other items listed in Section 4.23 Paragraph D shall be made unless such item is listed as a pay item in the Project Documents.

"Standard Work Zone Signs", "Barricades (Type I or II)", and "Barricades (Type III)" shall be measured as the sum of the maximum number of the individual types of these devices deployed at any one time during the project. For example: in Phase I of a project, two R2-1signs and four W20-1 signs were installed. Then in Phase II, four R2-1 signs and two W-20-1 signs were installed. In this instance, the Engineer would measure the four W20-1 signs from Phase I and the four R2-1 signs from Phase 2 resulting in a pay quantity for "Standard Work Zone Signs" of 8 Each.

"Work Zone Informational Signs", "Directional Signs" and "D-3 Signs" shall be measured per Each sign of the specified type delivered to the project. The removal and resetting of a these signs to the same or different location as may be necessary for construction sequencing, or as may be requested by the Engineer, shall not be measured.

"Portable Channelization Devices" shall be measured per each of the maximum quantity of devices deployed at any one time during the project. For example: suppose that in Phase I of a project, twenty Portable Channelization Devices are used and that in Phase II, forty Portable Channelization Devices are used. In this instance, the maximum quantity of devices used at any one time during the project is forty, resulting in a final pay quantity for "Portable Channelization Devices" of 40 Each. The removal and resetting of a Portable Channelization Devices to the same or different location as may be necessary for construction sequencing, or as may be requested by the Engineer, shall not be measured.

"Sequencing Arrow Panel" and "Portable Message Board" shall be measured per Each of the devices deployed for a period of one week or less. If a SAP or PMB is required for subsequent week(s), it shall be measured as an additional unit for each week it is deployed.

"Temporary Traffic Signal (#)" shall be measured by the lump sum for each temporary signal installed. If more than one temporary traffic signal is installed on a project, each temporary traffic signal shall be an individual pay item identified by the signals location. A pair of signals used for controlling one-lane two-way traffic shall be measured as a single installation.

"Continuous Detectable Barricades" shall be measured as the maximum total length of barricades installed on the project at any one time. Continuous Detectable Barricade placements shall be measured to the nearest foot along the face of the barricade. The removal and resetting of a Continuous Detectable Barricades to the same or different location as may be necessary for construction sequencing shall not be measured.

The various types, colors, and widths of "Temporary Pavement Marking (*) (**) (***)", "Waterborne Traffic Line Paint (**) (***)", and "Removable Line Masking Tape" shall be measured to the nearest foot along the length of each segment installed. The "skipped" portion of broken lines shall not be measured. Double lines shall be measured by the length of material actually installed. Removal of the Temporary Pavement Markings and Line Masking Tape shall not be measured and is subsidiary.

"Surface Drop-Off Treatment" shall be measured as the length of edge wedge constructed. Measurement shall be made to the nearest linear foot along the pavement edge protected.

(3) <u>Payment.</u> When included as a pay item in the Project Documents, and the Engineer finds the work to be in compliance with the project documents, the item "Traffic Control" shall be paid for on a lump sum basis, which payment shall be full compensation for providing, installing, adjusting, removing and resetting the work zone traffic control and work zone traffic control devices; and for all labor, equipment, tools and incidentals necessary to complete the work as specified. Partial payments will be made as follows:

Percent of Original Project Contract	Percent of Traffic Control That May Be		
Work Started	30%		
25%	50%		
50%	70%		
70%	90%		
100%	100%		

Payment for all installed, completed and accepted individual traffic control devices and temporary pavement markings, measured as provided above, shall be made at the Contract unit prices for the various items, which payment shall be full compensation for all materials labor, tools, equipment, and incidentals necessary to complete the work as specified.

4.25 ENCASEMENT PIPE

A. <u>General.</u> Furnish and install steel casing pipe of the size and at the location indicated in the Project Documents.

B. <u>Materials.</u> Encasement Pipe shall be steel pipe meeting the requirements of ASTM-139 and having the inside diameter and wall thickness indicated in the Project Documents or as determined by a Kansas licensed Professional Engineer. Encasement pipe shall have welded joints in accordance with AWWA C-206. Steel shall be Grade B under railroads and Grade A for all other locations.

Carrier pipe shall be supported in the encasement pipe with redwood or other preservative treated wood skids. Casing spacers manufactured for this application may be used in lieu of wood skids. Skids and spacers must be approved by the Engineer. Flowable Fill shall meet the requirements of subsection 5.09.

Trench back fill material shall meet the requirement of the Project Documents and Section 2.10.

Sand shall meet the requirements of fine aggregate for concrete as set forth in Section 5.01.

End caps shall be as specified in the Project Documents or otherwise approved by the Engineer.

C. <u>Construction Requirements.</u> Install encasement pipe by trenching or, when indicated in the project documents or approved by the Engineer, by boring, tunneling or jacking methods. Installation shall be to the lines and grades indicated in the Project Documents. Trenching and boring shall be completed as specified in Section 2. When encasement pipe is installed by boring or tunneling methods, the encasement pipe shall be jacked as the boring proceeds. Boring without simultaneous jacking of the encasement pipe is not permitted.

After the encasement pipe is installed and its position in the trench or bore tunnel stabilized, the encasement pipe shall be cleaned of all debris.

Wood skids shall be secured to the barrel of the carrier pipe with metal bands in such a manner as to support the weight of the pipe along its full barrel length on the wood skids without any of the weight being supported by the pipe bell and in such a manner as necessary to properly position the carrier pipe to the specified elevations and alignment. If manufactured casing spacers are used they must be located as recommended by the manufacturer and approved by the Engineer. The annular

space between the encasement pipe and the carrier pipe shall be filled with sand from end seal to end seal, and in such a manner as not to disturb the alignment or grade of the carrier pipe. Flowable fill may be used on sewers when approved by the Engineer.

End seals shall be constructed on each end of the encasement pipe as shown in the Project Documents or approved by the Engineer.

Trench backfill and compaction shall be as specified in Section 2.09 and 2.10 or otherwise indicated in the Project Documents.

D. Bid Items, Measurement and Payment.

1) Bid Items:

ENCASEMENT PIPE, (*) inch Steel Unit: Lineal foot (nearest 1 foot)

ENCASEMENT PIPE, (*) inch Steel (Bored, Jacked or Tunneled) Unit: Lineal foot (nearest 1 foot)

2) <u>Measurement</u>. The various sizes of encasements pipes shall be measured to the nearest foot along the centerline of the encasement pipe from end of pipe to end.

3) <u>Payment.</u> Payment for the various sizes of completed and accepted "Encasement Pipe, (*) –inch Steel and "Encasement Pipe (*) –inch Steel (Bored, Jacked or Tunneled)" will be made at the established Contract Unit Prices. Such payments are full compensation for all labor, materials, equipment and incidentals necessary to complete the work as specified.



Figure 4.1 – City of Topeka Brick Street Inventory Map

END OF SECTION

SECTION 5

CONCRETE PAVEMENT AND STRUCTURES

5.01 CONCRETE

A. <u>Classifications and Uses of Concrete</u>. Concrete under these specifications shall be divided into four classes: 1) Structure Class, 2) Pavement Class-A (3) Pavement Class-B, and 4) Commercial Grade.

(1) <u>Structure Class</u>. All cast-in-place structures shall be constructed from reinforced Structure Class concrete. Cast-in-place inlet tops may be either Structure Class or Pavement Class.

(2) <u>Pavement Class-A.</u> All concrete used for pavement subjected to vehicular traffic, valley gutters, drives, parking areas, median noses, curbs, and curb and gutter, shall be Pavement Class-A Concrete.

(3) <u>Pavement Class-B</u> All concrete placed on grade and not subjected to vehicular traffic, including sidewalks, ramps, median island caps, channel linings, trickle channels, wash checks, pipe outfalls and flumes shall be Pavement Class-B. At the Contractor's option and at no additional cost to the Owner, "Pavement Class-A concrete" may be used in lieu of Pavement Class-B concrete.

(4) <u>Commercial Grade</u>. All concrete for seal courses, temporary slabs or pavements, waterline blocking, plugs for pipes, or other items as designated by the Engineer shall be Commercial Grade. At the Contractor's option and at no additional cost to the Owner, Pavement Class-A, Pavement Class-B, or Structure Class concrete may be used in lieu of Commercial Grade concrete.

B. <u>Materials.</u> Concrete shall consist of a mixture of cementitious materials, water, and aggregates. In special situations, admixtures may be added if approved in advance by the Engineer.

(1) <u>Cementitious Materials.</u> Cement, flyash and slag in storage or stockpiled on the site shall be protected from any damage by climatic conditions which would change the characteristics or usability of the material.

i. <u>Cement.</u> Cement shall consist of Type I, II, III or IIIA Portland Cement, conforming to the requirements of ASTM C150. Type III and IIIA Cement may be used only when approved in advance by the Engineer or when being used for concrete pavement repairs.

ii. <u>Flyash.</u> Flyash shall conform to the requirements ASTM C618 for Class F Flyash.

iii. <u>Slag.</u> Slag used as a partial replacement for cement shall be Grade 100 or 120 Ground Granulated Blast Furnace Slag conforming to the requirements of ASTM C989.

(2) Aggregates.

i. <u>Fine Aggregate.</u> Fine aggregate for concrete shall consist of sand having clean, hard, durable, uncoated grains meeting the requirements for FA-A, as defined in Subsection 1102 of the KDOT Standard Specifications. Gradation of fine aggregate shall be as shown in Table 5.01 B (2) i. below.

TABLE 5.01 B (2) i – GRADING REQUIREMENTS FOR FINE AGGREGATE (KDOT TYPE FA-A)

Percent Retained on Square Mesh Sieves						
3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No.100
0	0-10	0-27	15-55	40-77	70-93	90-100

ii. <u>Coarse Aggregate</u>. Coarse Aggregate shall consist of washed gravel or crushed stone having clean, hard, durable, uncoated particles.

(1) <u>Structure Class.</u> All course aggregate for Structure Class concrete shall meet the requirement for SCA-2 as specified in Subsection 1102 of the KDOT Standard Specifications with the gradation specified below in Table 5.01B(2)ii.

(2) <u>Pavement Class-A.</u> All course aggregate for Pavement Class-A concrete shall meet the requirement for CPA-3 as specified in Subsection 1102 of the KDOT Standard Specifications with the gradation specified below in Table 5.01B(2)ii. As an additional requirement, all Pavement Class-A concrete shall be entirely granite, quartzite or trap rock and easily field identifiable in the concrete mix.

(3) <u>Pavement Class-B</u>. All course aggregate for Pavement Class-B concrete shall meet the Class I Aggregate requirements for CPA-3 as specified in Subsection 1102 of the KDOT Standard Specifications with the gradation specified below in Table 5.01B(2)ii.

Concrete		Percent Retained on Square Mesh Sieves						
Class	1 ½"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No.30
Structure			0	0-35	30-70	75-100	95-100	
Class								
Pavement		0	0-10	10-45	25-75	75-10	95-100	
Class-A								
Pavement			0	0-35	30-70	75-100	95-100	
Class-B								

TABLE 5.01B (2) ii. – GRADING REQUIREMENTS FOR CONCRETE COARSE AGGREGATE

iii. <u>Deleterious Substances.</u> The maximum deleterious substance content in aggregates used in concrete is shown in Table 5.01 B (2) iii. below.

TABLE 5.01B (2) iii. – MAXIMUM DELETERIOUS SUBSTANCES IN CONCRETE AGGREGATE

	Maximum Content By Weight		
Deleterious Substance	Fine	Coarse	
	Aggregate	Aggregate	
Clay Lumps and Friable Particles	1.0%	1.0%	
Sum of Clay Lumps, Friable Particles and Chert		1.0%	
Material Finer than No. 200 Sieve	2.0%	2.5%	
Coal and Lignite	0.5%	0.5%	
Sticks	0.1%	0.1%	
Shale or Shale-like material	0.5%	0.5%	
Organic Impurities	Pass Color Test		

iv. <u>Physical Property Requirements.</u> Aggregates used in concrete shall have the properties specified in Table 5.01 B (2) iv.

TABLE 5.01B (2) iv. – REQUIRED PHYSICAL PROPERTIES OF CONCRETE AGGREGATES

Physical Property and Test*			
	Fine Aggregate	Coarse Aggregate	
Soundness (except bridge decks), minimum,		0.90	
KTMR-21			
Soundness (bridge decks), minimum,		0.95	
KTMR-21			
Wear (Structural Class), maximum, KTMR-		40%	
25			
Wear (Pavement Class), maximum, KTMR-		50%	
25			
Modified Soundness (Limestone Rock		0.85	
only), minimum, KTMR-21		0.85	
Durability Factor (Limestone Rock only),		05	
minimum, KTMR-21		95	
Expansion (Limestone Rock only),		0.025%	
maximum, KTMR-21		0.023%	
Mortar Strength, KTMR-26	100%		
Absorption		0.5	

*Test as specified in KDOT "Construction Manual," August 2010 Edition

v. <u>Durability of Coarse Aggregate Test.</u> Testing of the durability of the course aggregate may be required by the Engineer.

vi. <u>Storage of Aggregates.</u> Aggregates shall be stored in a manner to permit free drainage and to avoid the inclusion of any foreign matter in the concrete. Stockpiles of aggregates shall be built in horizontal layers to avoid segregation. Heating of aggregates may be required when concreting is performed in cold weather. Aggregate, when heated, shall be from heated bins. Direct application of flame or steam through the aggregate will not be permitted.

(3) <u>Water</u>. Water used in mixing concrete shall be potable water. When authorized due to low air temperature, heated water may be used in the concrete. Water shall be heated to at least 70° F. and not more than 150° F.

(4) <u>Admixtures.</u> No admixtures, except for air-entraining admixtures, shall be used without the advance written approval of the Engineer. The Contractor shall submit the

type of admixture for approval by the Engineer. The Contractor is solely responsible for the appropriate use and effect of the admixture. The amount of admixture shall be determined by the Contractor. No additional compensation will be allowed for furnishing and incorporating the admixture into the work.

i. <u>Air Entraining Agent.</u> Air entraining agent shall conform to the requirements of ASTM C260.

ii. <u>Water Reducing Admixtures.</u> Water reducers, which may include set retarders, may be required when placing or finishing or when weather conditions are unfavorable and would be improved by use of a water reducer.

iii. <u>Plasticizers.</u> Unless approved in advance by the Engineer, plasticizers are not to be used. The maximum slump allowed with a plasticizer admixture is 8 inches. No water shall be added to the concrete mix after the addition of plasticizer.

iv. <u>Accelerating Admixtures.</u> Under very special conditions, such as an immediate need for opening a lane to traffic, concrete used in isolated pavement areas may include a non-chloride accelerator when approved by the Engineer.

(5) <u>Fiber Reinforcement.</u> When specified in the Project Documents or approved by the Engineer, fiber reinforcement shall be synthetic macro fibers that are monofilament, non-fibrillating made of 100% virgin polyolefin. The fibers shall have a length between 1.38" and 2.00" and a length to diameter ratio of 75 to 90. The minimum tensile strength of the fibers is 90 ksi. The application rates shall be based on the manufacturer's recommendations to provide a residual strength greater than 150 psi. Fiber reinforcement shall be mixed into the concrete according to manufacturer's requirements.

(6) <u>Curing Compound.</u> A liquid membrane-forming curing compound shall be used for all applications, unless otherwise specified by the Engineer. The compound shall conform to the requirements for Type 2 - White Pigmented Compound as specified in AASHTO M 148 and ASTM C 309.

C. Concrete Proportioning and Strength Requirements.

(1) <u>Submittal of Mix Design.</u> The Contractor shall furnish data to the Engineer on the proposed mix design for each concrete mix. The mix design shall indicate the source of the aggregates and cementitious materials. The test results from a trial batch or test results from a previous project using the mix design shall be submitted to the Engineer for review.

(2) <u>Strength Requirements.</u>

i. <u>Structure Class.</u> The minimum 28 day compressive strength of Structure Class concrete shall be 4,000 pounds per square inch, unless otherwise specified for individual projects.

ii. <u>Pavement Class-A and Pavement Class-B</u>. The minimum 28 day compressive strength of Pavement Class Class-A and Pavement Class-B concrete

shall be 4,000 pounds per square inch. The minimum 28 day flexural strength (Modulus of Rupture) shall be 600 pounds per square inch as determined by the third point loading method, unless otherwise specified for individual projects.

iii. <u>Commercial Grade</u>. The minimum 28 day compressive strength for Commercial Grade concrete shall be 2500 pounds per square inch.

(3) <u>Minimum Cementitious Material Content.</u> The minimum cementitious material content per cubic yard of concrete for each class shall be as shown in the following Table 5.01 C (3).

CONCRETE		
CONCRETE CLASS	MINIMUM CEMENTITIOUS MATERIAL CONTENT PER CUBIC YARD OF CONCRETE	
Structure Class	602 lbs. Type I/II Portland Cement (6.4 sacks)	
Pavement Class-A	600 lbs. with minimum of 450 lbs of Type I/II Portland Cement combined with Grade 100 or 120 Ground Granulated Blast Furnace Slag at a maximum of 25% of the combined total cementitious weight, or 600 lbs. with a minimum of 450 lbs. of Type I/II Portland Cement combined with Class F Flyash at a maximum of 25% of the combined total cementitious weight.	
Pavement Class-B	600 lbs. Type I/II Portland Cement (6.4 sacks)	
Commercial Grade	470 lbs. Type I/II Portland Cement (5.0 sacks)	

TABLE 5.01 C (3) – MINIMUM CEMENTITIOUS MATERIAL CONTENT OF CONCRETE

(4) <u>Water-to-Cement Ratio</u>. The selected ratio of water to cementitious material by weight in the mix must be low enough to ensure that durability, strength and wear resistance requirements are satisfied. Maximum water-to-cementitious material ratios for each concrete class shall be as shown in Table 5.01 C (4) below.

CONCRETE CLASS	POUNDS OF WATER PER POUND OF CEMENTITIOUS MATERIALS	
Structure Class	0.49	
Pavement Class-A and Pavement Class-B	0.44	
Commercial Grade	per approved design	

TABLE 5.01 C (4) – WATER TO CEMENTITIOUS MATERIAL RATIO

(5) <u>Aggregate Proportioning</u>. All mixes shall consist of at least two individual aggregates – fine aggregate and coarse aggregate. Proportioning of materials will be done on the basis of weight. Exact proportions of coarse and fine aggregates shall be stated in the mix design.

Except where otherwise directed by the Engineer, the proportion of coarse aggregate to total aggregate in Pavement Class-A and Pavement Class-B concrete shall be between 50 and 60%.

Structure Class concrete mixes shall be 50% coarse aggregate.

(6) <u>Entrained Air.</u> All concrete under these specifications, except Commercial Grade, shall be air entrained, unless otherwise specified for individual projects. Air content for Pavement Class-A, Pavement Class-B, and Structure Class concrete shall be 6.5% (\pm 1.5%) measured before and after placement of the concrete.

(7) <u>Slump.</u> The Contractor shall designate a slump for fresh concrete for each class that is within the following ranges:

Structure Class:	1 inch - 3 inches
Pavement Class-A:	1 inch - 3 inches
Pavement Class-B:	1 inch - 3 inches
Commercial Grade:	3 inches - 5 inches

Fresh concrete delivered to the site shall slump the amount designated with the approved mix design slump $\pm 25\%$ unless otherwise approved.

(8) <u>Alkali Content.</u> The sum of the acid soluble alkali content of portland cement plus either 1/6 of the alkali content of the flyash, or 1/2 of the alkali content of the slag, shall not exceed 5 lbs. per cubic yard.

D. Sampling and Testing.

(1) <u>Parties Responsible for Testing</u>. Sampling and testing of the materials used in the concrete, including the fine and coarse aggregates, and cementitious materials, shall be the responsibility of the Contractor. Tests shall be performed in accordance with the requirements of the various ASTM and KDOT standards and tests referenced in Subsections 5.02 B and 5.02 C. Test results from an ACI certified testing laboratory shall be furnished to the Engineer with the mix design.

Sampling and testing of the fresh concrete will be the responsibility of the Owner for Projects within the City Limits and as specified in the Project Documents for County projects.

(2) <u>Sampling Fresh Concrete</u>. Samples of fresh concrete shall be obtained and handled in accordance with ASTM C 172, "Sampling Fresh Concrete."

(3) <u>Consistency (Slump).</u> Slump tests of fresh concrete shall be made in accordance with ASTM C 143, "Slump of Portland Cement Concrete."

(4) <u>Air Content.</u> The air content of fresh concrete shall be determined by the volumetric method, ASTM C 173 or by the pressure method, ASTM C 231.

(5) <u>Compressive Strength.</u> During the progress of the work, compression tests will be made at designated time intervals when directed by the Engineer. A test will consist of a
minimum of two compression cylinders. A set of cylinders will be made, at a minimum, for each 150 cubic yards of concrete placed.

Compression test specimens will be made in accordance with the provisions of ASTM C 31. They will be laboratory cured cylinders to test the potential of the concrete that is delivered. No field-cured cylinders will be made unless required by the Engineer.

No individual test shall fall more than 500 pounds per square inch below design strength. The average of three consecutive tests shall equal or exceed design strength. If test strengths fail to reach the required compressive strength, the Engineer will require the Contractor to adjust the mix design. Concrete that fails to meet requirements may be removed from the work or not accepted for payment at the Engineer's discretion.

Compression test strengths exceeding the required compressive strength will not be considered as justification for increasing the water-cement ratio.

(6) <u>Flexural Strength.</u> Flexural strength tests may be required by the Engineer. A minimum of two beams shall be cast per test. Test procedures shall be in accordance with ASTM C31 and ASTM C78.

(7) <u>Mortar Bar Expansion</u>. Mortar bar expansion tests are required if the cementitious combination contains less than 25% slag or fly ash. The Mortar bar expansion shall be a maximum of 0.10% at 16 days when tested according to ASTM C1567.

E. Mixing, Delivery, and Placement.

(1) <u>Mixing</u>. All concrete shall be ready-mixed concrete complying with the provisions of ASTM C94.

(2) <u>Conveying</u>. The normal method of transporting concrete shall be via ready-mix truck.

(3) <u>Delivery Tickets.</u> A concrete delivery ticket shall be provided to the Engineer's Representative with each concrete load. The ticket shall contain the following information: plant name, w/c ratio, time batched, batch weights, design slump, water withheld (2 gallons per cubic yard maximum), dosage of all approved admixtures, and number of cubic yards of concrete batched.

(4) <u>Placing</u>. Concrete shall be deposited as nearly as practicable in its final position. Chutes used shall be such that the concrete slides in them and does not flow. Where a vertical drop greater than 5 feet is necessary, placement shall be through tremie chutes or similar devices to prevent segregation.

Concrete shall be placed before initial set has occurred, and in no event after it has retained its water content for more than 90 minutes, regardless of whether or not admixtures have been added. Unless otherwise specified, all concrete shall be deposited upon clean, damp surfaces, free from running water, or upon properly consolidated fills, but never upon soft mud or dry porous earth. No concrete shall be placed on frozen subgrade.

Concrete shall be placed under water only with the permission of the Engineer. The minimum cement content per cubic yard shall be increased by 10% at the Contractor's cost and the slump shall be increased to 6 inches. When depositing concrete in standing water, the concrete shall be carefully placed in the space in which it is to remain in a compact mass, by means of a tremie, bottom-dumping bucket or other approved method that does not permit the concrete to fall without adequate protection. Concrete shall not be disturbed after being deposited. Concrete shall be placed under water only in forms that are reasonably watertight. Unless authorized by Engineer, water shall not be pumped from inside forms while concrete is being deposited.

(5) <u>Cold Weather</u>. In cold weather, a concrete protection plan shall be submitted to the Engineer for review and approval. This plan shall include any admixtures and the means and methods for protecting the concrete from physical damage or reduced strength caused by frost, freezing actions, or low temperatures during the cure period.

Concrete shall be mixed and placed only when the temperature is at least 35°F. and rising unless other arrangements have been approved by the Engineer.

When the air temperature is at or is expected to fall below 40°F, the water and aggregates should be uniformly heated before mixing to obtain a concrete_mixture temperature of not less than 50°F and not more than 80°F at point of placement. The concrete pavement shall be maintained at a minimum temperature of 50°F, as measured along the surface of the concrete, for a minimum of 5 days after placing. A sufficient supply of approved moisture barrier material, other than liquid curing compound, and suitable blanketing material, such as straw, hay and burlap, shall be available if needed for all concrete placed between November 1 and April 1. Frozen materials or materials containing ice or snow shall not be used in the concrete. Calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, shall not be used in the mix unless approved by the Engineer. If, during the curing period, the temperature of the concrete falls below 32°F, the concrete shall be removed and replaced at the Contractor's expense.

When structural concrete is to be placed in cold weather and the air temperature has been below 35°F for 24 hours or more, the reinforcing steel shall be placed and the forms set. Forms and reinforcing shall then be heated to a minimum of 50°F, using an enclosure and space heaters, before concrete is placed.

When structural concrete is being placed and the ambient air temperature may be expected to drop below 35°F during the curing period, the Contractor shall provide insulating blankets or other approved insulating materials and/or hosing and artificial heat to maintain the concrete temperature between 50°F and 80°F as measured on the surface of the concrete. The surface of the concrete shall be kept moist by use of an approved moisture barrier such as wet burlap or polyethylene sheeting. The moisture barrier shall be maintained in intimate contact with the concrete during the entire curing period. After the completion of the required curing period, the Contractor shall remove the curing and protection in such a manner that rapid cooling of the concrete falls below 32°F, the concrete shall be removed and replaced at the Contractor's expense.

(6) <u>Hot Weather</u>. When concrete is being placed in warmer weather (ambient air temperatures above 80°F) the following shall apply:

i. <u>Temperatures Below 80°F</u>. When the ambient air temperature at the time of batching is expected to be below 80°F, concrete must be in place within ninety minutes after the water has been added.

ii. <u>Temperatures Between 81°F and 90°F</u>. When the ambient air temperature at the time of batching is expected to be between 81°F and 90°F, concrete must be in place within one hour after the water has been added unless an approved set-retarding admixture is used.

iii. <u>Temperatures Above 90°F.</u> When the ambient air temperature at the time of batching is expected to rise above 90°F, concrete must be in place within forty-five minutes after the water has been added unless an approved set-retarding admixture is used. In no case shall the concrete temperature exceed 90°F at the time of placement.

When concrete is being placed and the ambient air temperature may be expected to rise above 90°F, a specific hot weather protection plan shall be submitted to the Engineer for review and approval. Depending on the severity of the weather, the plan may include cooling of concrete mix to below 90°F, scheduling work to place and finish concrete during cool periods of the day, pre-wetting of forms and subgrade, rapid placement of curing material, use of fog spray or other methods recommended by ACI 305. Use of a retarder will be considered only in the most severe conditions and then only if delay of placement poses a threat to public welfare.

(7) <u>Consolidation</u>. Consolidation of concrete shall be accomplished with internal mechanical vibration. Vibration shall be transmitted directly to the concrete and in no case shall vibration be transmitted through the forms. The duration of vibration at any location in the forms shall be held to the minimum necessary to produce thorough compaction. Vibration shall be supplemented by forking or spading by hand adjacent to the forms on exposed faces in order to secure smooth, dense and even surfaces. Concrete shall be compacted and worked into all corners and angles of the forms and around reinforcement and embedded fixtures in such a manner as to prevent segregation of the coarse aggregate. Use of vibrators to move concrete within forms shall not be permitted. Vibrators shall not be dragged horizontally through the concrete.

The use of flex shaft or high cycle vibrators is required on all concrete slabs except those 4 inches or less in thickness.

F. Curing.

(1) <u>Curing Period.</u> All newly placed concrete shall be cured immediately after finishing for a minimum of 5 days, unless otherwise shown. Formed surfaces shall be cured if forms are removed prior to 5 days after concrete placement.

(2) <u>Application of Curing Compound</u>. A liquid membrane-forming curing compound shall be applied immediately after finishing and after the free water has left the surface of the concrete. The Contractor shall apply liquid membrane-forming curing compound in one application at a uniform rate of at least one gallon per 150 square feet of surface,

unless otherwise specified by the Engineer. Thinning the white membrane compound will not be permitted.

The treated surface shall be protected by the Contractor from injury of any sort for a period of at least 5 days. Any damage shall be repaired immediately. Immediately after forms are removed, the area formerly covered by forms, including the sides of slabs, shall be coated with curing compound at the rate specified above.

(3) <u>Other Curing Materials.</u> Burlap, white polyethylene sheeting, cotton mats, insulating blankets and other materials may be used to aid in curing as approved or specified by the Engineer.

G. <u>Measurement and Payment.</u> All materials, labor, tools, equipment and incidentals necessary for proportioning, testing, sampling, mixing, delivering, placing, consolidating and curing concrete shall not be paid for directly but shall be subsidiary to the item of work for which it is performed.

5.02 FORMS

A. Materials.

(1) <u>Forms.</u> Construction forms shall be sufficiently strong to support all loading without deflection either horizontally or vertically. Forms shall be composed of wood, metal, or other materials which have been approved in advance by the Engineer. Form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. Aluminum forms shall not be used.

(2) <u>Oil.</u> Oil applied to forms shall be any commercially available non-staining mineral oil or paraffin oil.

(3) Form Ties. Form ties shall be either epoxy coated steel or non-metallic.

B. Construction Requirements.

(1) <u>General.</u> Forms shall be built true to line and grade, mortar tight and sufficiently rigid to prevent displacement or sagging between supports. Forms shall be staked or braced sufficiently so that they will not be knocked out of line by any of the normal operations of placing and finishing the concrete. Construction of forms for the lifts of vertical walls shall be such as to make all parts of the walls easily accessible for the placement, spading and consolidation of the concrete as specified herein.

Curved concrete forms shall be used for construction of curved concrete unless the curve's radius is greater than 60 feet.

Joints in the forms shall be locked rigidly in true alignment to prevent play or movement.

All metal, including form ties, shall have at least 2 inches clearance from the face of the concrete unless otherwise specified. Wire ties will not be permitted where the concrete surface will be exposed to weathering and discoloration will be objectionable. Form ties shall be removed to a depth of $\frac{1}{2}$ inch below the concrete surface. All forms shall be so

constructed that they can be removed without hammering or prying against the concrete. Unless otherwise indicated, suitable molding shall be placed to bevel or round all exposed edges and expansion joints.

(2) <u>Coating of Forms.</u> Forms, other than those having non-absorptive form lining for exposed surfaces, shall be coated with non-staining oil which shall be applied shortly before the concrete is placed. Forms for unexposed surfaces may be thoroughly wetted with water in lieu of oil, immediately before the placing of concrete, except that in freezing weather oil shall be used. Form oil shall not be applied in a manner that will cause it to come in contact with reinforcing steel.

(3) <u>Removal of Forms.</u> The removal of forms shall be accomplished in such a manner as will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except when specifically authorized by the Engineer. During cold weather the time limits may be increased at the discretion of the Engineer depending upon the amount of protection provided. Permission to remove forms shall not constitute authority to backfill structures. Backfill shall proceed only upon approval of the Engineer and shall be based on concrete attaining 75% of design strength.

Pavement and Slabs12 hours*
Walls and Vertical Faces2 days*
Columns7 days
Unsupported Beams & Slabs:
Spans less than 10'4 days*
Spans from 10' to 20'7 days
Spans over 20' 10 days
*Curing of surfaces exposed by form removal is required.

(4) <u>Resetting or Replacing Forms.</u> Any forms disturbed, lost, or damaged for any reason including, but not limited to, high water, vandalism and theft, shall be reset or replaced to the satisfaction of the Engineer at the Contractor's sole expense.

C. <u>Measurement and Payment.</u> All materials, labor, tools, equipment and incidentals necessary for the construction of forms for concrete shall not be measured or paid for directly but shall be subsidiary to the item of work for which the forms are constructed.

5.03 REINFORCING STEEL

A. <u>Materials.</u> All reinforcing steel shall be free from mud, oil, paint, grease or other organic material that may adversely affect or reduce bond with the concrete. Shop drawings, bar lists, and splicing details shall be furnished to the Engineer by the Contractor when specified in the Project Documents.

(1) <u>Reinforcing Bars.</u> Reinforcing bars for concrete shall conform to the requirements of ASTM A615, Grade 40 or Grade 60 as specified in the Project Documents.

(2) <u>Welded Steel Wire Fabric.</u> Concrete reinforcing mesh shall be steel welded wire conforming to the requirements of ASTM A1064.

(3) <u>Tie bars.</u> Pavement tie bars shall be Grade 40 deformed steel bars, which conform to the requirements for reinforcing bars.

(4) <u>Dowels.</u> Steel Dowel bars shall be plain round steel bars conforming to the requirements of ASTM A615 (40 KSI).

(5) <u>Expansion Joint Assemblies</u>. Expansion joint assemblies shall meet the requirements of ASTM A615, Grade 40 and the requirements set forth in the Project Documents.

(6) <u>Supports and Spacers.</u> Reference is made to the latest edition of the CRSI "Manual of Standard Practice" for recommended industry practices concerning reinforcing steel supports and spacers. Use only wire type bar supports. Plastic chairs are not acceptable. Rocks, bricks or other non-steel supports are not acceptable.

B. <u>Construction Requirements.</u> The Contractor shall furnish and install all reinforcement, including bars, fabric, and structural shapes as indicated in the Project Documents or otherwise required by standard concrete construction practice.

(1) <u>Placing Reinforcement.</u> All reinforcement shall be accurately placed, with clear spacing between main reinforcement and concrete surfaces as shown in the Project Documents or as may be directed by the Engineer.

The minimum clear distance between parallel bars shall be $1\frac{1}{2}$ times the nominal diameter of the bar, $1\frac{1}{2}$ times the maximum size of the coarse aggregate, or $1\frac{1}{2}$ inches, whichever is greater.

Prior to placement of concrete, reinforcement shall be in place and reviewed by the Engineer. Reinforcing steel shall be supported by spacers, hangers, or other reinforcing steel and secured in place with wire ties or suitable clips. Embedments shall be secured with templates.

Positioning tolerances for centerline of reinforcing shall be $\pm 1/4$ inch for members less than 12" thick and $\pm 3/8$ inch for larger members. Locations of laps and bends shall be true to ± 2 inches. Location of ends of reinforcing shall be true to $\pm 1/2$ inch. Location of Embedments shall be true to $\pm 1/4$ inch.

(2) <u>Splicing.</u> Splices shall be installed in accordance with the Project Documents and Shop Drawings. Where splices in reinforcement, in addition to those indicated, are necessary and approved by the Engineer, there shall be sufficient lap to transfer the stress by bond, as may be directed. Bars shall be lapped not less than 30 diameters unless otherwise shown, and splices shall be staggered. Welding or tack welding of reinforcement shall not be permitted.

(3) <u>Supports.</u> All reinforcement shall be secured in place, true to the lines and grades indicated, by the use of metal or concrete supports, spacers, or ties. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation, and shall be used in such a manner that they will not be exposed on the face or in any way discolor or be noticeable in the surface of the finished concrete.

A sufficient number of metal bar supports or pins shall be used to hold all bars in proper position according to the Project Documents.

(4) <u>Resetting or Replacing Reinforcing Steel.</u> Any reinforcing steel disturbed, lost, or damaged for any reason including, but not limited to, high water, vandalism and theft, shall be reset or replaced to the satisfaction of the Engineer at the Contractor's sole expense.

C. Bid Items, Measurement and Payment.

(1) <u>Bid Items:</u>

REINFORCING STEEL, GRADE 40 Unit: Lbs. (nearest 10 lbs.)

REINFORCING STEEL, GRADE 60 Unit: Lbs. (nearest 10 lbs.)

(2) <u>Measurement.</u> When listed as a bid item in the Project Documents "Reinforcing Steel, Grade 40" and/or "Reinforcing Steel, Grade 60", shall be measured by the weight of the reinforcing steel including reinforcing bars, welded wire fabric, dowels, tie bars and any other steel reinforcing. The weight shall be determined in pounds based upon the theoretical length and unit weight of the reinforcing steel as shown in the Project Documents plus or minus any additions or reductions of reinforcing steel installed as requested or approved by the Engineer. The weight of the steel shall be rounded to the nearest 10 pounds for each application for payment.

(3) <u>Payment.</u> When listed as a bid item in the Project Documents, Reinforcing Steel, Grade 40 and Reinforcing Steel, Grade 60 measured as specified above, shall be paid for at their respective Contract unit prices, such payments shall be full compensation for the furnishing, fabrication, placing, splicing, and supporting of the reinforcing steel as specified, and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

5.04 CONCRETE STRUCTURES

A. Materials.

(1) <u>Concrete</u>. Concrete used in both precast and cast-in-place concrete structures shall be Structure Class Concrete meeting all the requirements specified in Subsection 5.01.

(2) <u>Forms.</u> Forms used for cast-in-place concrete structures shall meet all the requirements specified in Subsection 5.02.

(3) <u>Reinforcing Steel.</u> Reinforcing steel used in both precast and cast-in-place concrete structures shall meet all the requirements specified in Subsection 5.03.

B. Construction Requirements.

(1) <u>Excavation, Subgrade and Foundation Preparation.</u> The excavation, subgrade and foundation preparation for concrete structures shall be completed as specified in Section 2, Excavation, Backfill and Compaction. The Contractor shall not place forms or reinforcing prior to the Engineer's approval of the subgrade. Structure Excavation shall

not be measured or paid for directly, but shall be subsidiary to the structure for which the excavation is performed, including retaining walls and combined sidewalk and retaining walls.

(2) Forms. Forms shall be set as specified in Subsection 5.02.

(3) <u>Reinforcement.</u> Reinforcing steel shall be set as specified in the Project Documents and Subsection 5.03.

(4) Placing Concrete for Structures.

i. <u>Walls and Columns.</u> Walls and columns supporting concrete beams, concrete joists, or concrete slabs shall be poured to the underside of such beams, joists, or slabs at least 8 hours before the placement of the superimposed work, or as directed by the Engineer.

ii. <u>Vibration</u>. Concrete shall be consolidated with the aid of mechanical vibrating equipment. Vibration shall be transmitted directly to the concrete and in no case shall vibration be transmitted through the forms. The duration of vibration at any location in the forms shall be held to the minimum necessary to produce thorough consolidation. Vibration shall be supplemented by forking or spading by hand adjacent to the forms on exposed faces in order to secure smooth, dense and even surfaces. Use of vibrators to move concrete within forms shall not be permitted. Vibrators shall not be dragged horizontally through the concrete.

(5) <u>Finishing.</u>

i. <u>Unexposed Surfaces.</u> Concrete for which no other finish is specified shall have fins and rough edges removed.

ii. <u>Surfaces Exposed to Sight or Weather</u>. All unsightly ridges or lips shall be removed and local bulging shall be remedied by tooling and rubbing. All holes left by the removal of rods and all voids, unless otherwise directed, shall be reamed and filled with mortar as directed.

iii. <u>Top Surfaces of Walls.</u> Walls shall be brought to the proper elevations as shown on the Drawings and top surfaces finished with a wood float to a true and regular surface. The application of sand or cement drier will not be permitted. No water shall be present when the surfaces are finished.

iv. <u>Floors.</u> Concrete floors shall be finished by the proper use of the bull float. The use of the jitterbug will not be permitted. Troweling shall not be done until concrete has hardened sufficiently to prevent excess fine material being worked to the surface. An approved clear hardener/anti-dusting compound shall be applied after curing. Slabs shall be sloped as shown on the Drawings.

v. <u>Cavities</u>. The cavities on all exposed surfaces shall be filled with portland cement mortar. The resulting surface shall be smooth and sound, and shall match the adjacent surfaces in color and texture. Cavities on unexposed surfaces

shall be filled with an approved material, including roof cement or portland cement at the Contractor's option.

(6) <u>Tolerances.</u> All members except inverts and footings shall be no more than 1/4 inch thinner nor 1/2 inch wider than shown in the Project Documents. Thickness of footings shall be no more than 5% thinner than shown in the Project Documents. Formed surfaces shall be within the following tolerances:

i. <u>Vertical Lines</u>. Vertical lines, edges and surfaces shall be plumb to 1/4 inch in 10 feet, and 1/2 inch in the entire length.

ii. <u>Horizontal Lines</u>. Horizontal lines and edges shall be level to within 1/4 inch in 20 feet, and 1/2 inch in the entire length.

iii. <u>Linear Elements.</u> Linear elements shall be at the position shown on the Drawings to within 1/2 inch. Embedments shall be at position shown on the Drawings to within 1/4 inch.

(7) <u>Special Requirements for Combined Sidewalk and Retaining Walls.</u> Where combined sidewalks and retaining walls are constructed without rustication of the face of the wall, the wall forms shall have ³/₄" chamfer strips (front and back) aligning with the joints in the sidewalk member to make certain the vertical joints of the wall align with the sidewalk joints.

C. Bid Items, Measurement and Payment.

(1) <u>Bid Items:</u>

STRUCTURE CLASS CONCRETE (<u>*</u>)	Unit: Cubic Yard (Nearest 0.1 C.Y.)
COMBINED SIDEWALK AND RETAINING WALL	Unit: Liner Foot (Nearest 0.1 L.F.)

(*) – Type of Structure, e.g. RCB, Ret-Wall, Bridge, etc.

(2) <u>Measurement.</u> When concrete structures are quantified in the Project Documents under the item "Structure Class Concrete (*)", the concrete shall be measured by the volume of the concrete in the structure. No deduction shall be made for the volume of reinforcing steel encapsulated by concrete. The volume shall be the computed theoretical volume of the solid portion of the structure plus or minus any additions or reductions to the concrete construction requested or approved by the Engineer. The volume shall be computed and rounded to the nearest 0.1 cubic yard for each application for payment.

"Combined Sidewalk and Retaining Wall" shall be measured by the linear foot along the base of the wall to the nearest 0.1 linear foot..

(3) <u>Payment.</u> Where the Project Documents quantify construction of a concrete structure under the Pay Item "Structure Class Concrete" payment for completed and accepted work, measured as provided above, shall be made at the corresponding Contract Unit Price. Such payment shall be full compensation for the furnishing, mixing, transporting, forming, placing, supporting, consolidating, and curing necessary for the

construction of the concrete structure as specified, and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

Completed and accepted "Combined Sidewalk and Retaining Wall", measured as provided above, shall be paid for at the corresponding Contract Unit Price. Such payment shall be full compensation for the furnishing, mixing, transporting, excavating, backfilling, forming, reinforcement placing, supporting, consolidating, and curing necessary for the construction of the retaining wall and adjacent sidewalk, and for all reinforcing steel, concrete, materials, equipment, tools, labor, and incidentals necessary to complete the work.

5.05 CONCRETE PAVEMENT, VALLEY GUTTERS, DRIVEWAYS, CURBS AND GUTTERS, AND MEDIAN NOSES

A. <u>Scope.</u> This Subsection 5.05 applies to all concrete pavement, slabs, truck aprons, valley gutters, driveways, parking lots or other concrete subjected to vehicular traffic. This subsection also applies to all types of concrete curb, all types of combined curb and gutter, and concrete median noses.

B. Materials.

(1) <u>Concrete</u>. Concrete used in pavements subjected to vehicular traffic, median noses, and all types of curb and curb and gutter shall be Pavement Class-A concrete as specified in Subsection 5.01.

(2) Forms. Forms shall be as specified in Subsection 5.02.

(3) <u>Reinforcing Steel.</u> Reinforcing steel, dowel bars, dowel baskets, welded wire fabric, and tie bars shall be as specified in Subsection 5.03.

(4) <u>Expansion Joint Material</u>. Expansion joint filler material shall be non-extruding and resilient filler which conforms to the requirements of AASHTO M 213 and ASTM D 1751-04. Unless indicated otherwise in the Project Documents, expansion joint filler shall be ½ inch thick and extend the entire thickness of the concrete slab.

i. <u>Basis of Acceptance</u>. Expansion joint material shall be accepted based upon the Engineer's receipt of a manufacturer's certification or catalog cut indicating the material meets the requirements specified and upon the Engineer's visual inspection of the material in place.

(5) <u>Joint Sealants</u>. Any joint sealants used shall be approved by the Engineer prior to installation. Joint sealants shall be manufactured to provide for filling the entire joint depth without the use of backer rod. Backer rod is not acceptable.

i. <u>Hot Type Joint Sealants.</u> Hot type joint sealants shall be specifically manufactured for use in sealing joints in portland cement pavements and shall meet all applicable requirements of ASTM D3406. The contractor shall furnish to the Engineer a certification or catalog cut that the sealant used meets these requirements.

ii. <u>Silicone Joint Sealant.</u> The silicon joint sealant shall be either Type I (Non Self-Leveling) or Type II (Self-Leveling). Joint sealants shall be a one-part cold applied silicone formulation that is self-priming to and compatible with portland cement concrete. Acetic acid cure sealants are not acceptable. Type II sealants shall be self-leveling within the joint and shall provide a satisfactory surface configuration without tooling. The silicone sealants shall meet all requirements of ASTM D5893 and shall also comply with the following applicable test requirements:

Property	<u>Type I</u>	<u>Type II</u>
(1) Skin development time, minutes	120 max.	120 max.
(2) Cure-through	pass	pass
(3) Extrusion rate, grams/minute	90/250	200/600
(4) Non-volatile content, %	90 min.	90 min.
(5) Bond to concrete, @ 0° F.,		
5 cycles, 100% extension	pass	pass
(6) Compression set	pass	pass
(7) Elongation, %	600 min.	1000 min.

iii. <u>Basis of Acceptance.</u> Joint sealants will be accepted based upon the Engineer's receipt of a manufacturer's certification that the material supplied meets the requirements specified, and upon the performance of the material in the field.

C. <u>Construction Requirements for Concrete Pavement, Driveways, Median Nose, Curb, and</u> <u>Combined Curb and Gutter.</u>

(1) <u>General.</u> Construction of Concrete Pavement, Driveways, Median Noses, Curb, and Combined Curb and Gutter shall meet the requirements for Pavement Class-A concrete set forth in Subsection 5.01 and in this Subsection 5.05 C.

(2) <u>Paving Equipment.</u> All uniform sections and full lanes of pavement 75 lineal feet or greater in length shall be paved with a self-propelled slipform or bridge deck paver. This machine shall be designed specifically for paving operations and shall be capable of producing an adequately consolidated concrete surface, true to grade, free of large open-textured areas and without excessive flushing of the mortar. It shall be accurately adjustable to conform to the plane of the pavement surface. The pavement equipment shall be approved by the Engineer prior to submittal of bids for all trafficway projects.

Commercially made vibratory screeds and roller screeds may be used only on irregular sections of pavement if approved by the Engineer. Screeds must be of the heavy-duty type, have mechanical propelling mechanism, be adjustable as to length, and be adjustable as to crown or valley.

Air compressors used for cleaning joints shall be equipped with suitable traps capable of removing all surplus water and oil in the compressed air.

(3) <u>Subgrade Preparation and Treatment</u>. Subgrade preparation and treatment shall be as specified in Sections 3.10 and 3.11. The Contractor shall receive the Engineer's approval of the subgrade prior to placing forms, placing reinforcement or pouring pavement or curbs. Aggregate Base - Type AB-3 may be used under driveways within

the public right-of-way for the purpose of making final adjustment to dirt subgrade where necessary to insure proper final grade and thickness. Sand is not allowed as a fine grading material. Maximum allowable thickness of compacted Aggregate Base - Type AB-3 shall be 6 inches unless approved otherwise by the Engineer.

(4) <u>Forms.</u> Forms used for fixed form concrete paving shall be as specified in Subsection 5.02.

(5) <u>Reinforcement.</u> Reinforcing steel, steel dowel bars, tie bars, and wire fabric shall be installed at the locations shown in the Project Documents. Reinforcement shall be prevented from shifting due to normal finishing operations and shall be installed as specified in Subsection 5.03.

(6) <u>Manholes and Valve Castings.</u> Manholes and valve castings located in a traffic lane shall be adjusted to meet the grade and slope of the adjacent pavement surface in the manner, and within the tolerances, specified in Subsection 6.07 B. (8).

(7) <u>Placing of Concrete.</u> The Contractor shall place concrete only after the Engineer has approved the subgrade, forms and reinforcement. The concrete shall be deposited on the subgrade for the full width between forms and in a manner that will prevent segregation and which will require as little rehandling as possible. The amount of material so deposited shall be in excess of the amount required. Any additional spreading necessary shall be done with hand shovels. Concrete shall not be placed on frozen or muddy subgrade.

If a slipform paver is used, no tolerance will be allowed for edge sloughing. If edge sloughing occurs during paving operations, these operations shall cease until adjustments in the paver or concrete are made. The Contractor shall verify during paving operations that the edge of the pavement is a true plane surface.

(8) <u>Consolidation</u>. After placement in its approximate final position, the concrete shall be consolidated by means of spud vibrators inserted into the concrete. This operation may be performed by hand or may be performed by vibrators attached to an approved machine in a spreading and strike-off operation.

i. <u>Curbs and Gutter</u>. Consolidation of the concrete for curbs and gutter shall be accomplished with internal mechanical vibration. Vibration shall be transmitted directly to the concrete and in no case shall vibration be transmitted through the forms. The duration of vibration at any location in the forms shall be held to the minimum necessary to produce thorough compaction. Vibration shall be supplemented by forking or spading by hand adjacent to the forms on exposed faces in order to secure smooth, dense and even surfaces.

(9) <u>Finishing Pavement.</u> After the concrete is spread it shall be struck off and further consolidated and screeded with an approved finishing machine or machines. The finishing machine shall be moved ahead at an approximately uniform rate. It shall have a vibration unit in the screed that shall be stopped when the machine is not moving forward. A slight excess of concrete shall be kept ahead of the screed at all times.

The use of a concrete finishing agent must be approved by the Engineer.

Hand finishing operations may be used for narrow widths and irregular areas where the use of an approved finishing machine is impractical. Hand finished concrete shall be thoroughly consolidated with hand spud vibrators. Following hand strikeoff, the concrete shall be in a condition equal to that produced by an approved finishing machine. There shall be no change in slump in hand finished areas.

(10) <u>Straightedge Floating Pavement.</u> After the final pass of the finishing machine, the entire surface shall be floated with straightedges not less than 10 feet in length. The straightedges shall be operated parallel to the pavement centerline starting at the center and progressing toward the forms. Advance along the road shall be in successive stages of not more than half the length of the straightedges. The edges of the pavement will be checked transversely by straight edge at close enough intervals to assure a plane surface at the pavement edge or form line. All laitance, surplus water and inert material shall be removed from the surface. All high places shall be worked down and all low places filled by combined operations of flats and straightedges until no irregularities exist. The proper crown of the pavement shall be maintained throughout the operations.

(11) <u>Texturing Pavement</u>. As soon as all excess moisture has disappeared and while the concrete is still plastic enough to make a granular surface possible, a drag shall be used which shall consist of a seamless strip of damp burlap or cotton fabric which shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. The drag shall be maintained in such condition that the resultant surface is of uniform appearance and reasonably free from grooves over 1/16 inch deep. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags substituted.

(12) <u>Finishing and Texturing Median Nose, Curbs and Gutter</u>. Exposed surfaces shall be shaped to the section shown in Standard Drawing DT-003 by using either a slip form curb machine or steel tools and trowels and then brushed lightly. Brushing shall be parallel to the roadway centerline. The cross section of the finished shape of the curb and gutter section shall not be more than ¹/₂" deviated from the standard dimensions shown on DT-003. If deviations are more than ¹/₂", then curb and gutter sections must be removed and replaced at the Contractor's expense.

All exposed edges and joint edges shall be rounded with an edging tool having a radius of 3/8 inch. Moisture shall not be applied to the surface of the fresh concrete unless approved by the Engineer.

(13) <u>Curing</u>. Curing shall be as specified in Subsection 5.01 F.

(14) <u>Joints</u>. Joints shall be constructed in accordance with the details shown in the Project Documents and these specifications with the best of workmanship. All joints in roadway pavement and alleys shall be formed by sawing. Joints in driveways, parking areas, curbs, and combined curbs and gutters may be formed by either tooling or sawing. All joints formed by sawing shall be pressure washed, sand blasted, blown clean and sealed with an approved joint sealant compound. Failure to construct the joints in the best possible manner will be cause for suspension of work until the cause of the defective work is remedied.

The length of concrete panels shall not exceed 1.5 times the width. Panels shall be square or rectangular wherever possible. Interior angles less than 60 degrees at the corners of panels shall be avoided.

i. Types and Locations of Joints.

(1) Longitudinal Joints. Longitudinal joints shall be constructed as shown in the Project Documents. Approved guide lines or devices shall be furnished to insure cutting the longitudinal joint on the true line as shown in the Project Drawings.

(2) <u>Expansion Joints.</u> Expansion joints shall be installed where the new pavement butts against rigid objects, at all intersections between sidewalks and driveways, between driveways and pavement curb, and at all other locations indicated in the Project Documents or determined by the Engineer. Expansion joints shall be formed with ½ inch prefabricated non-extruding filler and shall extend the full depth of the slab. All expansion joints shall be sealed with approved joint sealant.

(3) <u>Welded Expansion Joint Assemblies.</u> When specified in the Project Documents, expansion joints with welded expansion joint assemblies and expansion joint filler shall be installed in continuous lengths of pavement. Expansion joint assemblies shall be installed at the locations and in the manner specified in the Project Documents.

(4) <u>Contraction Joints.</u> Contraction joints shall be at the spacing shown in the Project Documents. The spacing of contraction joints in feet shall generally not exceed two times the pavement thickness in inches, but shall in no case exceed 15 feet unless approved in advance by the Engineer.

(5) <u>Construction Joints.</u> A butt construction joint, as shown in the Project Documents, shall be made perpendicular to the centerline of the pavement at the close of each day's work, and also when the process of depositing concrete is stopped for a length of time such that, in the opinion of the Engineer, the concrete will have taken its initial set. Smooth Dowel bars shall be spaced along the joint as shown in the Project Documents. No construction joint shall be placed within 10 feet of an expansion joint or another construction joint.

ii. Joints in Curbs and Gutters, Driveways, and Parking Areas. Joints shall be constructed in curbs and gutters, driveways and parking areas at the locations or spacings shown in the Project Documents and may be formed by either tooling or sawing. Where curb and gutter sections are adjacent to concrete pavement sections, the joints shall match those in the pavement. Spacing shall not exceed 15 feet.

Tooled joints in curbs and gutters shall be formed by taking an approved tool, such as a margin trowel, at the joint location and separating the aggregate in the concrete through the entire curb section from the curb down its face and along the gutter to a depth of at least 4 inches below the surface. A 1/4 inch groove 1

inch deep is then made at the joint location while the concrete is still plastic enough to be worked but hard enough that it will not slump after grooving.

Tooled joints in slabs shall be formed by making a ¹/₄ inch groove 25% of the depth of the slab while the concrete is still plastic enough to be worked but hard enough that it will not slump after grooving.

Joints formed by "tooling" do not need to be sealed with joint compound. All joints formed by sawing shall be pressure washed, sand blasted, blown clean and sealed with an approved joint sealant compound.

A butt construction joint shall be made at the close of each day's work or when the work is stopped long enough so that the previously placed concrete would have taken its initial set. This joint shall extend completely through the slab and be perpendicular to the finished surface.

iii. <u>Sawing of Joints.</u> All joints to be sawed shall be wet sawed and constructed as shown in the Project Documents. The Contractor shall obtain a Noise Permit if sawing of pavement is anticipated to be necessary between 10 PM and 7 AM within the City of Topeka.

Sawing of joints shall be constructed in two stages as follows:

(1) First Stage. The first saw-cut shall be a relief cut approximately 1/8 inch wide and to a minimum depth of 1/3 the thickness of the slab. Joints shall be sawed as soon as concrete has hardened sufficiently to prevent excessive tearing and raveling and before conditions induce uncontrolled cracks, regardless of the time or weather. The Contractor is responsible for sawing at the appropriate time and making sure that any equipment used does not damage the new pavement. Suitable guide lines or devices shall be used to insure the joint is cut straight and has the correct geometrics in relation to centerline. Curing membrane damaged during sawing operation shall be repaired by the Contractor as directed by the Engineer.

(2) <u>Second Stage</u>. Widening of the relief joints to full width (3/8" maximum) shall not be performed until the concrete is at least 48 hours old and shall be delayed longer when the sawing causes raveling of the concrete. If second stage sawing is performed prior to completion of the curing period, the Contractor shall maintain the cure by use of curing tarps, plastic devices, or other approved materials. Curing membrane damaged during the sawing operation shall be repaired by the Contractor as directed by the Engineer. The second stage cut shall be exactly centered over the relief cut and sawed 1-1/4"deep or as otherwise specified in the Project Documents.

Should any spalling of the sawed edges occur which would detrimentally affect the joint seal; it shall be patched with an approved epoxy patching compound and allowed to harden prior to installation of the joint material. Each patch shall be true to the intended neat lines of the finished cut joint.

Any transverse joint requiring hand finishing and edging shall be edged with a tool having a radius of 1/8 inch unless otherwise directed by the Engineer. The horizontal surface of the edger should not indent the surface of the pavement.

iv. <u>Cleaning Freshly Cut Sawed Joints.</u> Immediately after sawing the joint, the resulting slurry shall be completely removed from the joint and the immediate area by flushing with a jet of water under pressure, and by the use of other tools as necessary.

v. <u>Cleaning Joints</u>. Just prior to sealant being applied, a final cleaning of the joint shall be made by sandblasting the joint, followed by an air blast to clean incompressibles from the joint. If one sandblaster nozzle is used, the joint shall be cleaned once in each direction, concentrating on one joint face at a time. If a two nozzle arrangement is used, the nozzles shall be aimed so each nozzle concentrates its blast on one joint face.

Air compressors used for cleaning joints shall be equipped with suitable traps capable of removing all surplus water and oil in the compressed air. This compressed air will be checked daily by the Engineer for contamination. When contaminated air is found to exist, work shall not resume until suitable adjustments are made and the air stream is found to be free of such contaminants.

vi. <u>Sealing Joints.</u> All sawed joints shall be sealed with an approved sealant. The location and configuration of the joint sealant shall be as shown in the Project Documents. Joints must be sealed prior to opening to traffic. The Contractor shall provide a manufacturer's technical representative at the beginning of the joint sealing operation to make available technical expertise in proper joint preparation and cleaning; and application of the sealant in strict compliance with manufacturer's recommendations and these Specifications. The manufacturer's representative shall ensure that both the Inspector and Contractor are familiar with the proper procedures. The Engineer may waive this requirement for Contractors that are experienced in installing the type and brand of material being used.

(1) <u>Curing and Seasonal Limitations.</u> Joints shall not be sealed until they are thoroughly clean and dry and the pavement is at least five days old unless otherwise stipulated in the manufacturer's publications and approved by the Engineer. Sealant shall not be applied to wet or damp concrete or installed during inclement weather. Joint sealant application will not be permitted when the ambient air temperature is less than 40°F or as specified in the manufacturer's publications.

(2) <u>Filling Joints.</u> The joint sealer, silicone or hot type, shall be applied by an approved mechanical device from inside the joint in such a manner that causes it to wet the joint surfaces. The sealer shall be placed in reasonably close conformity with dimensions shown in the Project Documents. Any unreasonable deviation will be cause for rejection of the joint until satisfactory corrective measures are taken. The Type I silicone sealant is not self leveling and will not position properly in the joint under its own weight; therefore, the sealant surface shall be tooled using the appropriate tool to produce a slightly concave surface approximately 1/4 inch below the pavement surface as shown in Standard Drawing DT-002. Tooling shall be accomplished before a skin forms on the surface. The use of soap or oil as a tooling aid will not be permitted. Any failure of the joint material in either adhesion or cohesion will be cause for rejection, and the joint shall be repaired to the Engineer's satisfaction at the Contractor's expense. Hot type joint sealant shall fill the joint to a point level with the pavement surface and shall be applied with a pressure applicator.

(3) <u>Cleaning Pavement</u>. After a joint has been sealed, all surplus joint sealer on the pavement or structure surfaces shall be promptly removed.

(4) <u>Traffic.</u> Traffic shall not be permitted over sealed joints until the sealer is tack free, or until debris from traffic does not imbed into the sealant.

(15) <u>Pavement Protection and Weather Limitations</u>. Fresh concrete shall be adequately protected from heavy rains and mechanical injury including vandalism. The weather limitations set forth in Subsections 5.01 E (5) and (6) shall apply.

(16) <u>Opening to Traffic.</u> New concrete pavement shall not be opened to vehicular traffic until the strength requirements set forth in the following Table 5.05 C (16) are satisfied.

Slab Thickness	Minimum Requirements for Opening to Traffic
Less than 7.0"	5 Days Cure Time and 3,500 psi Compressive Strength*
7.0" or thicker	5 Days Cure Time and 3,000 psi Compressive Strength*
Any thickness of High	24 Hours Cure Time and 3000 psi Compressive Strength*
Early Strength Concrete	

Table 5.05 C (16) - Strength Requirements for Opening Pavement to Traffic

*Compressive Strength as indicated by cylinder breaks.

D. <u>Basis Of Acceptance</u>. Completed Concrete Pavement, Valley Gutters, Driveways, Curbs and Combined Curb and Gutter shall be accepted based upon strength, surface trueness, surface smoothness, thickness, and surface condition.

(1) <u>Strength.</u> Completed Concrete Pavement, Valley Gutters, Driveways, Curbs and Combined Curb and Gutter shall be accepted for strength based upon the requirements of subsection 5.01 C (2) and test methods set forth in Subsection 5.01 D (5) and (6). At the Engineer's discretion, concrete that fails to meet these requirements shall be either removed and replaced with suitable concrete at the Contractors expense, or may remain in place without payment for such item.

(2) <u>Surface Trueness</u>. The pavement surface and edges shall be true to the lines and grades shown in the Project Documents. The pavement cross slope shall be maintained.

The cross section of the finished shape of the curb and gutter section shall not be more than $\frac{1}{2}$ " deviated from the standard dimensions shown on DT-003. If deviations are more than $\frac{1}{2}$ ", then curb and gutter sections must be removed and replaced at the Contractor's expense.

The finished gutter flowline of combined curb and gutter and valley gutters shall be checked with a 10-foot straight edge to ensure positive drainage in the gutter. If gutter ponds water deeper than 1/8 inch, then the Engineer may require that the curb and gutter or valley gutter section be removed and replaced at the Contractor's expense.

The pavement surface will be checked by the Engineer using a 10-foot straightedge at selected locations at the Engineer's discretion. The maximum allowable variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed ¼ inch longitudinal or transverse. Any areas with surface variations greater than the maximum allowable shall be corrected at the expense of the Contractor. Corrective action shall be completed at the Contractor's expense as specified in Subsection 5.05 D (3) iii.

(3) <u>Surface Smoothness and Trueness - Profilograph Testing</u>. When designated in the Project Documents, profilograph testing shall be performed in addition to straightedge testing. This does not preclude the use of straightedge testing to maintain a true pavement surface.

i. <u>Tolerances.</u> Pavements having an average profile index of 45.0 inches or less per mile per 0.1 mile section of a traffic lane shall be accepted for smoothness and trueness. Pavement with initial profiles over 45.0 inches may be accepted after corrective measures have been performed.

For determining pavement sections where corrective work will be necessary, the pavement will be evaluated in 0.1 mile sections of each traffic lane using a profilogram as specified below.

Within each 0.1 mile section of a traffic lane, all areas representing high points having deviations in excess of 0.4 inches in 25 feet or less shall be corrected by the Contractor.

Any 0.1 mile section of a traffic lane, including bumps, having an initial profile index between 45.1 and 65.0 inches per mile, shall be corrected to reduce the profile index to 45 inches or less per mile on each trace.

Any 0.1 mile section of a traffic lane, including bumps, having an initial profile index of 65.1 inches per mile or greater, shall be corrected to reduce the profile index to 45.0 inches or less per mile on each trace or replaced at the Contractor's option.

On sections where corrections are made, the pavement will be tested by the Contractor to verify that corrections have produced a profile index of 45.0 inches or less per mile for each trace.

If an average profile index of 65.0 inches per mile is exceeded in any one day's paving operation, the paving operation will be suspended and will not be allowed

to resume until corrective action is taken by the Contractor. In the event that paving operations are suspended as a result of the average profile index exceeding 65 inches per mile per 0.1 mile, subsequent paving operations will be tested in accordance with the initial testing procedures.

Within the pavements subject to testing the following areas shall be excluded for determination of initial index:

- Horizontal curves with centerline radius of less than 1000 feet,
- Pavement within superelevation transitions, and,
- Pavement within warp section of an at-grade intersection.

However, all areas representing high points having deviations in excess of 0.4 inches in 25 feet or less in the areas listed above shall be corrected by the Contractor.

ii. <u>Testing Methods and Requirements.</u> This subsection covers methods and requirements for testing and reporting pavement trueness. Topics covered are locations for profilograph testing, equipment, surface testing, and smoothness evaluations.

The Contractor shall furnish the profilogram and his evaluation to the Engineer. The testing and evaluation shall be performed by a trained and certified operator, and the evaluation shall be certified by the operator. The testing procedure and evaluation of the tract shall be performed in accordance with KT-46 of the Kansas Department of Transportation's *Construction Manual*, latest edition. Results shall be furnished to the Engineer within two working days after testing of the pavement and again within two working days after any corrections are made.

- (1) <u>Submittals.</u> Contractor shall submit the following for review:
 - Profilograph and operator certifications
 - Profilograph trace and certified interpretation and checking template

(2) <u>Test Locations.</u> The contractor shall provide trueness testing, interpretation and corrective action at the following locations:

- Pavements identified for profilograph, smoothness, or trueness testing in the Project Documents shall be tested and corrected.
- Pavements, which are not otherwise identified for testing, shall be tested when they exhibit poor subjective ride quality, as determined by the Engineer. Such determination may include all or part(s) of the pavement on a given project.

(3) <u>Areas Excluded from Profilograph Testing</u>. The following areas are excluded from the profilograph testing requirements:

- Bridge decks
- Shoulders
- Acceleration and deceleration lanes
- Patches or hand finished pavements less than 100 feet in length

(4) <u>Equipment.</u> The profile index will be determined using a California type profilograph or other style of machine that yields compatible results and which is approved by the Kansas Department of Transportation, Bureau of Materials and Research. The equipment shall be furnished and operated by the Contractor as specified in KT-46.

(5) <u>Surface Test.</u> Pavement profiles will be taken in accordance with KT-46. A profilogram will be made for each continuous placement of 50 feet or more. The profilogram will include the 15 feet at the ends of the section only when the Contractor is responsible for the adjoining surface. Additional profiles may be taken only to define the limits of an out-of-tolerance surface variation.

Individual sections shorter than 50 feet shall be inspected by testing with a 10-foot straightedge, a responsibility of the Engineer. The 15 feet at the ends of longer sections will also be inspected in this manner when excluded from the profilogram.

(6) <u>Smoothness Evaluation.</u> During the initial pavement operations, either when starting up or after a long shutdown period, the pavement surface will be tested with the profilograph as soon as the concrete has cured sufficiently to allow testing. Curing membrane damaged or protective cover removed during the testing operation shall be repaired or replaced by the Contractor as directed by the Engineer. Initial testing will be used to aid the Contractor and the Engineer in evaluating the paving methods and equipment. If the initial pavement smoothness, paving methods, and paving equipment are acceptable to the Engineer, the Contractor may proceed with the paving operation.

(7) <u>Daily Average Profile Index</u>. A daily average profile index will be determined for each day's paving operation. A day's paving operation is defined as a minimum of 0.1 mile of full-width pavement placed in a day. If less than 0.1 mile is paved, the day's production will be grouped with the next day's production. If the production of the last day of project paving is less than 0.1 mile, it will be grouped with the previous day's production.

iii. <u>Corrective Actions.</u> Corrections to pavement not meeting the specified smoothness and trueness requirements, as determined by straightedge and/or profilograph testing, shall be made using an approved profiling device or by removing and replacing the pavement. Bush hammers or other impact devices will not be permitted. Where surface corrections are made, the Contractor shall establish a uniform texture the full width of the lane. However, transverse grooving will not be required. Corrective work shall be at the Contractor's expense and shall be completed prior to determining pavement thickness.

The Engineer may perform profilograph testing on the surface for monitoring and comparison purposes. The Engineer may test the entire project length if it is determined that the Contractor-certified test results are inaccurate. If the Contractor's test results are inaccurate, and the profilograph testing is completed by the Engineer, the Contractor will be charged for this work at a rate of \$400.00 per mile, per profile track, with a minimum charge of \$800.00. Furnishing inaccurate tests may result in decertification of the Contractor's certified operator.

iv. <u>Pay Adjustments.</u> No pay adjustment will be made based on results of profilograph or straightedge testing. The Contractor shall correct work as outlined in this section – including removal and replacement of pavement – as required to produce pavement complying with the specified tolerances.

(4) <u>Pavement Thickness</u>. Completed concrete pavement shall be accepted for thickness based upon caliper measurement of cores extracted from the completed concrete. The extraction of concrete pavement cores and patching of the hole shall be subsidiary to the concrete pavement and completed by the Contractor.

For the purpose of measuring concrete pavement thickness for compliance with the Project Documents, pavement units to be considered separately are defined as 1,000 linear feet of pavement in each traffic lane starting at the end of the pavement bearing the smaller station number. Bridge wearing surfaces shall not be included in the 1,000 linear foot unit. The last unit in each lane shall be 1,000 feet plus the fractional part of 1,000 feet remaining. One pavement core will be extracted at a random location in each unit and measured.

In irregular areas and areas that are less than 1,000 feet in length; units shall be considered in 1,000 square yard units of pavement or fraction thereof for the purpose of measuring pavement thickness. One core will be extracted for measurement from a location determined by the Engineer within each 1000 square yard or smaller pavement unit. Irregular areas include, but are not limited to, ramps, widening transitions of acceleration and deceleration lanes, intersections, entrances, and crossovers.

Concrete pavement for a 1000 foot lane or 1000 square yard unit will be accepted for thickness and paid for at full price when the first core from the pavement unit is not deficient by more than 0.2 inch from the thickness specified in the Project Documents.

When the thickness of the first core from any unit is deficient more than 0.2 inch from the thickness specified in the Project Documents, two additional cores within the 1,000 foot unit will be taken at intervals of not less than 300 feet, or two additional cores within the 1,000 square yard unit will be taken at locations such that the pavement will be well represented. The average thickness of the unit will be determined by using the measurements of the three cores taken in that unit. In calculating the average thickness of the pavement, measurements which are in excess of the specified thickness by more than 0.2 inch will be considered as the specified thickness by more than 1.0 inch will be considered as the specified thickness by more than 1.0 inch will be considered as the specified thickness by more than 1.0 inch will be considered as the specified thickness specified, full payment will be made.

If the average thickness of pavement is deficient from the specified thickness by more than 0.2 inch, but not more than 1.0 inch, payment will be made at an adjusted price as specified in Table 5.05 D (4).

TABLE 5.05 D (4) - Price Adjustment for Concrete Pavement Thickness Deficiency

Deficiency in thickness	
as determined by cores, inches	

Proportioned part of contract price allowed

0.00 to 0.20	100 percent
0.21 to 0.30	. 80 percent
0.31 to 0.40	72 percent
0.41 to 0.50	68 percent
0.51 to 0.75	57 percent
0.76 to 1.00	50 percent

If the pavement core is more than 1 inch deficient in thickness, the Contractor will be required to remove such deficient areas and to replace them with pavement of satisfactory quality and thickness. When the distance between the end of a section requiring removal and replacement and an expansion, contraction or construction joint is less than 10 feet, the entire pavement up to the joint shall be removed and replaced at the expense of the Contractor. An area shall be removed so that new construction joints are a minimum of 10 feet apart. The Contractor shall receive no compensation for materials or labor involved in the removal or the replacement of the deficient pavement. With the consent of the Engineer, the Contractor may leave the deficient pavement in place and receive no compensation or payment for such pavement. The area of concrete pavement for which no payment is made shall be identical with the area of pavement that the Contractor would be required to remove and replace as provided above.

When the thickness of any core is deficient by more than 1.0 inch from the thickness specified in the Project Documents, exploratory cores will be taken at intervals not less than 10 feet parallel to the center line in each direction from the deficient core until an exploratory core is taken in each direction which is not deficient by more than 1.0 inch. Exploratory cores are to be used only to determine the length of pavement in a unit that is to be left in place without pay or removed and replaced.

Deductions for deficient thickness may be entered on any application for payment after the information becomes available.

(5) <u>Surface Condition</u>. The Contractor shall thoroughly clean the concrete pavement, gutters and curbs prior to opening to traffic. The Contractor shall repair or remove and replace any damaged pavement, broken panels, spalls, uncontrolled cracks, honeycombs, grooves, gouges or otherwise defective pavement. Defective concrete work shall be repaired to the satisfaction of the Engineer or the defective concrete work removed and replaced. The repair or removal and replacement of defective concrete work shall be entirely at the Contractor's expense.

E. Bid Items, Measurement and Payment.

(1) <u>Bid Items:</u>

(*)" **REINFORCED CONCRETE PAVEMENT** Unit: Square Yard (nearest S.Y.)

(*) " NON-REINFORCED CONCRETE PAVEMENT Unit: Square Yard (nearest S.Y.)

(*) " NON-REINFORCED DOWEL JOINTED CONCRETE PAVEMENT Unit: Square Yard (nearest S.Y.) CONCRETE VALLEY GUTTER

Unit: Square Yard (nearest 0.1 S.Y.)

(*) " CONCRETE DRIVEWAY Unit: Square Foot (nearest S.F.)

COMBINED CURB AND GUTTER, TYPE (#) Unit: Lineal Foot (nearest L.F.)

COMBINED CURB AND GUTTER (MODIFIED), TYPE (#) Unit: Lineal Foot (nearest L.F.)

6" INTEGRAL CURB	Unit: Lineal Foot (nearest L.F.)
6" EDGE CURB	Unit: Lineal Foot (nearest L.F.)

6" PROTECTION CURB Unit: Lineal Foot (nearest L.F.)

(*) Specified thickness of concrete pavement in inches

(#) Type I, II, III or IV combined curb and gutter as specified in Std. Drawing DT-003

(2) <u>Measurement.</u> The various thicknesses of Reinforced Concrete Pavement, Non-Reinforced Concrete Pavement, Concrete Driveway and Concrete Valley Gutter, shall be measured by the surface area of concrete pavement constructed. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the units noted above for each application for payment. Pavement areas which have been determined by the methods specified in Subsection 5.05 D (4) to be more than 1.0 inch thinner than the thickness specified in the Project Documents shall not be measured unless the deficient pavement has been removed and replaced with suitable pavement.

All of the various types of Combined Curb and Gutter and all types of Curb shall be measured by the length along the face of the curb at a point 6 inches from the back of curb. Individual segments of Curb and Combined Curb and Gutter shall be measured to the nearest 0.1 foot, summed and rounded to the nearest foot for each application for payment.

The Concrete Median Nose will not be measured and paid for directly but shall be subsidiary to combined curb and gutter.

(3) <u>Payment.</u> Payment for the various thicknesses of completed accepted Reinforced Concrete Pavement, Non-Reinforced Concrete Pavement, Concrete Driveway and Concrete Valley Gutter Concrete Pavement, measured as provided above, shall be made at the respective Contract Unit Prices subject to price adjustments for thickness deficiencies as stipulated in Subsection 5.05 D (4).

Payment for completed, and accepted, Curbs and Combined Curb and Gutters, of the various types measured as provided above, shall be made at the respective Contract Unit Prices.

Such payments shall be full compensation for furnishing and mixing of the concrete materials, furnishing and installing forms, reinforcing steel, expansion joints, joint sealant, and curing compound, and the mixing, transporting, pouring, consolidating, finishing, texturing, jointing, tooling, sawing, curing, protecting, testing and coring of the

concrete, mobilization and providing all traffic control, unless provided by the owner or established as a separate pay item, and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

5.06 SIDEWALKS, RAMPS, CHANNEL LININGS, PATTERNED STAMPED COLORED CONCRETE, AND OTHER CONCRETE PLACED ON GRADE.

A. <u>Scope.</u> This Subsection 5.06 applies to all concrete sidewalks, multi-use paths, sidewalk ramps, concrete channel linings, concrete channel transitions, concrete wash checks, concrete trickle channels, concrete flumes, concrete median island caps, concrete steps and other concrete placed on grade and not subjected to vehicular traffic.

B. <u>Materials</u>. Materials incorporated into the construction of the concrete items included in the scope of this Subsection 5.06 shall meet all of the requirements of Subsection 5.01 B and the requirements specified as follows:

(1) <u>Concrete</u>. Concrete placed on grade and not subjected to vehicular traffic shall be Pavement Class-B concrete. At the Contractor's option and at no additional cost to the owner, Pavement Class-A concrete or Structure Class Concrete may be used in lieu of Pavement Class-B concrete. Any admixtures shall meet the requirements of Subsection 5.01.B (4)

(2) <u>Forms.</u> Forms shall be as specified in Subsection 5.02.

(3) <u>Reinforcing Steel.</u> Reinforcing steel, welded wire fabric, and tie bars shall be as specified in Subsection 5.03.

(4) <u>Fiber Reinforcement</u>. If specified in the Project Documents or approved by the Engineer, Fiber Reinforcement shall be as specified in Subsection 5.01 B (5).

(5) <u>Curing Compound.</u> Curing compound shall be as specified in Subsection 5.01 B(6).

(6) <u>Expansion Joint Material.</u> Expansion joint filler material shall be as specified in Subsection 5.05 B (4).

(7) Joint Sealant. Joint Sealant shall be as specified in Subsection 5.05 B (5).

(8) <u>Detectable Warning Area Materials.</u> Sidewalk ramp detectable warning areas shall consist **of ADA Solutions Detectable Warning Panels or Armor cast Detectable Warning Panels** (or a pre-approved equivalent). All new detectable warning materials installed in a single intersection as part of the same project must be of like type, color and appearance.

Detectable warning pavers shall have a compressive strength greater than 8000 psi, a water absorption maximum of 5% and shall meet or exceed ASTM C-936 and freeze-thaw testing per Section 8 of ASTM C-67.

Truncated domes shall have a diameter of 0.9 to 1.4 inches at the bottom, a diameter of 50% to 65% base diameter at the top, a height of 0.2 inch and a center-to-center spacing of 1.6 to 2.4 inches.

Detectable warning area materials shall provide a minimum of 70 percent contrast in light reflectance between the detectable warning areas and the adjoining surface.

(9) <u>Colorant.</u> Where colored concrete is specified in the Project Documents, the colorant admixture shall be an integral, chemically inert, fade resistant mineral oxide or synthetic type. The color shall be as indicated in the Project Documents or as directed by the Engineer. Samples of the color shall be submitted to the Engineer for approval prior to incorporation into the work.

C. <u>Construction Requirements for Sidewalks, Channel Linings, Patterned Stamped Concrete</u> and Other Concrete Placed On Grade.

(1) <u>General.</u> Construction of concrete sidewalks, multi-use paths, sidewalk ramps, concrete channel linings, concrete channel transitions, concrete wash checks, concrete trickle channels, concrete flumes, concrete stairs and other concrete placed on grade and not subjected to vehicular traffic shall meet the requirements for Pavement Class-B concrete set forth in Subsection 5.01 and in this Subsection 5.06 C.

(2) <u>Subgrade Preparation</u>. Subgrade preparation shall be as specified in Subsection 3.10, Earthwork and Grading. Unless otherwise specified the subgrade under concrete items included in the scope of this Subsection 5.06 shall be compacted to the requirements of Type AB Compaction as defined in Subsection 2.09. The Contractor shall receive the Engineer's approval of the subgrade prior to placing forms, placing reinforcement or pouring pavement or curbs.

Aggregate Base - Type AB-3 may be used under sidewalks, multi-use paths and sidewalk ramps within the public right-of-way for the purpose of making final adjustment to dirt subgrade, where necessary, to insure proper final grade and thickness of sidewalks, paths and sidewalk ramps. Sand is not allowed as a fine grading material.. Allowable maximum thickness of compacted Aggregate Base - Type AB-3 shall be 6 inches, unless approved otherwise by the Engineer.

(3) <u>Forms.</u> Forms shall be as specified in Subsection 5.02.

(4) <u>Reinforcement.</u> Reinforcing steel, tie bars, and wire fabric shall be installed at the locations shown in the Project Documents and as specified in Subsection 5.03. Reinforcement shall be prevented from shifting due to normal finishing operations.

(5) <u>Manholes and Valve Castings</u>. Manholes rings and valve castings shall not be located in sidewalks, sidewalk ramps, channel linings or other concrete placed on grade. If, in the opinion of the Engineer, it is not practical to locate concrete in a manner that avoids manholes rings or valve castings, the ring or casting shall be adjusted to meet the grade and slope of the adjacent pavement surface within 1/8 inch and as specified in Subsection 6.07 B. (8).

(6) <u>Placing of Concrete</u>. The Contractor shall place concrete only after the Engineer has approved the subgrade, forms and reinforcement. The concrete shall be deposited on the

subgrade for the full width between forms and in a manner that will prevent segregation and require as little re-handling as possible. The amount of material so deposited shall be in excess of the amount required. Any additional spreading necessary shall be done with hand shovels. Concrete shall not be placed on frozen or muddy subgrade.

(7) <u>Consolidation and Finishing Concrete</u>. The concrete shall be consolidated by the use of hand-operated screeds, tampers, and longitudinal floats. The use of spud vibrators is required on concrete slabs greater than 4 inches in thickness. The surface shall receive a light broom finish (no steel troweling). Brooming shall be in the direction of drainage. All exposed edges, including joints, shall be rounded with an edging tool having a radius of 3/8 inch. All surfaces shall be plane and true to form. All laitance, surplus water and inert material shall be removed from the surface. All high places shall be worked down and all low places filled by combined operations of flats and straightedges until no irregularities exist. Addition of water to the surface of concrete to assist in finishing operations will not be permitted.

When approved by the Engineer, finishing machines or slip form pavers may be used where access to the work and extent of the work allows the practical use of such equipment.

(8) <u>Joints.</u>

i. Expansion Joints. Expansion joints shall be placed at all intersections between sidewalks and driveways, sidewalks and ramps, between old and new walks where old and damaged walks are being repaired and replaced, and at all other locations called for in the Project Documents. Expansion joints shall be formed with ½ inch prefabricated non-extruding filler and shall extend the full depth of the slab. All expansion joints shall be sealed with approved joint sealant.

ii. <u>Contraction Joints</u>. Contraction joints shall be formed at intervals shown in the Project Documents or if not shown, the interval shall be equal to the width, but not to exceed 10 feet, (e.g., a 5-foot sidewalk jointed at 5-foot intervals). They shall be formed by making a ¼ inch groove 25% of the depth of the slab while the concrete is still plastic enough to be worked but hard enough that it will not slump after grooving. Contraction joints formed by "tooling" do not need to be sealed with joint compound.

iii. <u>Construction Joints.</u> A butt construction joint shall be made at the close of each day's work or when the work is stopped long enough so that the previously placed concrete would have taken its initial set. This joint shall extend completely through the slab and be perpendicular to the finished surface.

(9) <u>Curing.</u> Curing shall be as specified in Subsection 5.01 F.

(10) <u>Pavement Protection and Weather Limitations.</u> Fresh concrete shall be adequately protected from heavy rains and mechanical injury including vandalism. No construction traffic shall be permitted to traverse fresh concrete for a period of 4 days unless otherwise approved. The weather limitations set forth in Subsections 5.01 E (5) and (6) shall apply.

D. <u>Additional Construction Requirements for Sidewalk Ramps.</u> Sidewalk ramps shall be constructed to the lines and grades shown in the Project Documents using 6" thick Pavement Class-B Concrete. Ramps shall have a detectable warning area complying with the latest accessibility guidelines and the Project Documents. A 6-inch concrete thickness shall be placed under the detectable warning area.

All new detectable warning materials installed in a single intersection as a part of the same Project must be of like type, color and appearance.

(1). <u>Size</u>. Detectable warnings shall generally be 24 inches in the direction of travel. They shall extend the full width of the traversable portion of the ramp (full width of the walking surface), but shall not extend onto the portion of the ramp transitioning back to curb height.

(2) <u>Dome Alignment.</u> Domes shall be aligned on a square grid in the predominant direction of travel to permit wheels to roll between domes. Unless shown otherwise in the Project Documents, the dome alignment shall be perpendicular to the centerline of the roadway or entrance for which the pedestrian crossing is being constructed.

(3) <u>Visual Contrast.</u> There shall be a minimum of 70 percent contrast in light reflectance between the detectable warning and an adjoining surface.

E. <u>Additional Construction Requirements for Colored Concrete and Patterned Colored Concrete.</u> When indicated in the Project Documents, the Contractor shall construct colored concrete or patterned colored concrete to provide a concrete pavement surface replicating paving brick or stone. The color and pattern shall be as indicated in the Project Documents, or as directed by the Engineer.

Colored concrete and patterned colored concrete shall be constructed according to the requirements of these Specifications and the manufacture's specifications. Where a discrepancy exists between the manufacturer's specifications and these Specifications, the Engineer shall determine which specifications apply.

Adjacent areas of patterned colored concrete shall be from the same concrete mix design, as variations in cement and water content can affect color. Lower slump concrete is recommended. Adjacent areas shall be protected from staining.

The respective pattern types and colors of concrete for the Patterned Colored Concrete shall be placed at the locations shown on the plans, struck off and compacted until a layer of mortar is brought to the surface. The concrete shall be screeded to the required grade and cross section and floated to a uniform surface. The forming tools for the patterned concrete shall be applied to form the pattered surfaces while the concrete is still in the plastic stage of set.

Colored concrete and patterned colored concrete areas shall be formed, reinforced, placed, consolidated, jointed, cured and protected as outlined in Subsection 5.06 C. Expansion joint material (1/2") shall be installed between patterned colored concrete and adjacent curbs. Pattern colored concrete for median island surfaces, excluding median noses, shall be 4 inches thick and shall not require reinforcing unless the Project Documents indicate otherwise.

F. <u>Basis of Acceptance</u>. Completed concrete sidewalks, multi-use paths, sidewalk ramps, concrete channel linings, concrete channel transitions, concrete wash checks, concrete trickle

channels, concrete flumes, concrete stairs, and other concrete placed on grade and not subjected to vehicular traffic shall be accepted based upon strength, surface trueness, thickness, and surface condition.

(1) <u>Strength.</u> Completed concrete construction of the items within the scope of this Subsection 5.06 shall be accepted for strength based upon the requirements and test methods set forth for Pavement Class-B concrete in Subsection 5.01 D (5) and (6). At the Engineer's discretion, concrete that fails to meet these requirements shall be either removed and replaced with suitable concrete at the Contractors expense, or may remain in place without being measured or paid for.

(2) <u>Surface Trueness and Thickness.</u> The pavement surface and edges shall be true to the lines and grades shown in the Project Documents. Sidewalks and trails shall meet the requirements of the latest accessibility guidelines. Unless approved otherwise by the Engineer, the cross section of finished shapes shall not be more than $\frac{1}{2}$ " deviated from the dimensions shown in the Project Documents. If deviations are more than $\frac{1}{2}$ ", then the concrete must be removed and replaced at the Contractor's expense.

(3) <u>Surface Condition</u>. The Contractor shall thoroughly clean the completed concrete. The Contractor shall repair or remove and replace any damaged concrete, broken panels, spalls, uncontrolled cracks, honeycombs, grooves, gouges or otherwise defective pavement. Defective concrete work shall be repaired to the satisfaction of the Engineer or the defective concrete shall be removed and replaced. The repair or removal and replacement of defective concrete work shall be entirely at the Contractor's expense.

G. Bid Items, Measurement and Payment.

(1) <u>Bid Items:</u>

(*) " CONCRETE SIDEWALK, (**) WIDE	Unit: Square Foot (nearest S.F.)
SIDEWALK RAMP	Unit: Square Foot (nearest S.F.)
CONCRETE CHANNEL LINING	Unit: Square Yard (nearest S.Y.)
CONCRETE PIPE OUTFALL TRANSITIO	N Unit: Square Foot (nearest S.F.)
CONCRETE WASH CHECK	Unit: Square Foot (nearest S.F.)
CONCRETE TRICKLE CHANNEL	Unit: Square Foot (nearest S.F.)
CONCRETE FLUME	Unit: Square Foot (nearest S.F.)
CONCRETE STAIRS	Unit: Square Foot (nearest S.F.)
(*)" COLORED CONCRETE PAVEMENT	Unit: Square Foot (nearest S.F.)

(*)" PATTERNED COLORED CONCRETE PAVEMENT Unit: Square Foot (nearest S.F.)

- (*) -- Specified thickness of concrete in inches
- (**) Specified width of sidewalk in feet

(2) <u>Measurement.</u> The various thicknesses and widths of Concrete Sidewalk, Colored Concrete, and Pattern Colored Concrete, and Concrete Channel Lining, Concrete Pipe Outfall Transitions, Concrete Wash Checks, Concrete Trickle Channels, Concrete Flumes, shall be measured by the surface area of concrete pavement constructed.

Cut off and toe walls shall not be measured and shall be considered subsidiary.

Sidewalk Ramps shall be measured by surface area but only to a maximum of 6 foot length at centerline.

Concrete Steps shall be measured by surface area of the steps (both rise and run). Reinforcing steel for steps shall be subsidiary.

Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the units noted above for each pay request.

(3) <u>Payment.</u> Payment for the various thicknesses and widths of Concrete Sidewalk, Colored Concrete, and Patterned Stamped Colored Concrete, and for Sidewalk Ramps, Concrete Channel Lining, Concrete Pipe Outfall Transitions, Concrete Wash Checks, Concrete Trickle Channels, Concrete Flumes, and Concrete Steps measured as provided above, shall be made at the respective Contract Unit Prices. There will be no separate payment for sidewalk detectable warning system, as all costs associated with the work shall be included in the price bid for "sidewalk ramps".

Such payments shall be full compensation for furnishing and mixing of the concrete materials, furnishing and installing forms, reinforcing steel, expansion joints, joint sealant, and curing compound, and the mixing, transporting, pouring, consolidating, finishing, texturing, jointing, tooling, sawing, curing, protecting, testing and coring of the concrete, mobilization and providing all traffic control, unless provided by the owner or established as a separate pay item, and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

5.07 PARTIAL-DEPTH CONCRETE PAVEMENT REPAIR

A. <u>Types of Partial-Depth Concrete Repairs</u>. Partial-depth concrete repairs (patching) shall be classified as Type A, Type B, or Type C. The requirements for the preparation of the patching area for Type A and B repairs are the same. Type A and B repairs differ only by the requirements for the patch material installed. The requirements for Type C repairs differ from the requirements for Type A and B repairs by the manner in which the patch area may be prepared. The materials used for the Type C repairs are the same as the materials for Type B repairs. The types of partial depth patches are defined below.

(1) <u>Type A.</u> Type A partial-depth concrete repairs require patch material consisting of high early strength Pavement Class-A concrete containing Type IIIA cement, or preformulated manufactured rapid-set concrete materials. Type A patching is limited to patch sizes of 4 square feet or less, unless otherwise indicated in the Project Documents or directed by the Engineer. Preparation of the patch area for Type A repairs requires saw-cutting a rectangular perimeter around the deteriorated concrete to be repaired.

(2) <u>Type B</u>, Type B partial-depth concrete repairs require patch material consisting of normal set Pavement Class-A concrete mixes. When approved by the Engineer, 8-sack Pavement Class-A concrete mixes or Pavement Class-A concrete with accelerating admixtures may be used. At the Contractor's option, and at no additional cost to the Owner, the Contractor may use Type A patching material for Type B concrete repairs. Preparation of the patch area for Type B repairs requires saw-cutting a rectangular perimeter around the deteriorated concrete to be repaired.

(3) <u>Type C.</u> Type C concrete pavement repairs shall only be used where existing concrete pavement will receive an asphalt overlay, RCI (Reflective Crack Interlayer) overlay, or where indicated in the Project Documents or directed by the Engineer. The Type C repair specification is a minimum requirement.

Type C patching partial-depth concrete repairs require patch material consisting of normal set Pavement Class-A concrete mixes. When approved by the Engineer, 8-sack Pavement Class-A concrete mixes or Pavement Class-A concrete with accelerating admixtures, may be used. At the Contractor's option, and at no additional cost to the Owner, the Contractor may use Type A patching material for Type C concrete repairs. Preparation of the patch area for Type C repairs does not require saw-cutting a rectangular perimeter around the deteriorated concrete to be repaired.

B. <u>Materials</u>. Materials incorporated into the construction of partial-depth concrete repairs shall meet all of the requirements of Subsection 5.01 B and the requirements specified as follows:

(1) <u>Concrete</u>. When concrete is used for partial-depth patches it shall be Pavement Class-A concrete unless otherwise approved by the Engineer.

(2) <u>Forms.</u> Forms shall be as specified in Subsection 5.02.

(3) <u>Reinforcing Steel.</u> Reinforcing steel, welded wire fabric, and tie bars shall be as specified in Subsection 5.03.

(4) <u>Fiber Reinforcement</u>. If specified in the Project Documents or approved by the Engineer, Fiber Reinforcement shall be as specified in Subsection 5.01 B (5).

(5) <u>Curing Compound.</u> Curing compound shall be as specified in Subsection 5.01 B(6).

(6) <u>Expansion Joint Material.</u> Expansion joint filler material shall be as specified in Subsection 5.05 B (4).

(7) Joint Sealant. Joint Sealant shall be as specified in Subsection 5.05 B (5).

(8) <u>Pre-Formulated Manufactured Rapid-Set Concrete Materials</u>. Rapid Set Cementious materials used in Type A or B patching must be selected from the following four pre-approved products:

PavePatch 3000

Dayton Superior Corporation 4226 Kansas Avenue

	Kansas City, KS 66106
Rapid Set DOT Repair Mix	CTS Manufacturing Corporation 9156 Gilmore Lake Road Columbia, IL 62236
Five Star Highway Patch	Five Star Products, Inc. 750 Commerce Drive Fairfield, CT 06430
PavePatch DBM	Conspec, a Dayton Superior Company 4226 Kansas Avenue Kansas City, KS 66106

All rapid set concrete materials shall include extender as per the manufacturer's recommendations.

(9) <u>Bonding Agent for Pre-Formulated Manufactured Rapid-Set Concrete Materials.</u> Bonding agent used with rapid set concrete materials shall be as per the manufacturer's recommendations or, if not specified by the manufacturer, an epoxy bonding agent **or cementitous grout**.

(10) <u>Epoxy Bonding Agent.</u> Epoxy bonding agent shall be a two-component, epoxyresin bonding system for application to Portland Cement concrete, which is able to cure under humid conditions and bond to damp surfaces. The bonding agent shall meet the requirements for Type V Epoxy-resin Bonding Systems for Concrete and shall be of the class appropriate for the temperature of the concrete being patched as specified in Section 1705 of the KDOT Standard Specifications. Rezi-weld 1000 is an approved bonding agent for use at 40 degrees Fahrenheit and above.

C. Construction Requirements.

(1) <u>General.</u> The Engineer shall mark in the field the limits of the deteriorated concrete pavement to be removed. The area of "Partial Depth Concrete Repair (Type A)" shall be 4 square feet or less, unless otherwise indicated in the Project Documents or directed by the Engineer. If patch areas are less than 12 inches **clear distance between the areas**, the areas shall be combined into a single patch. The thickness of any partial depth concrete pavement repair shall be determined as the excavation of the patching area progresses, depending upon the depth of deteriorated concrete in the slab, but the thickness of a concrete repair shall be a minimum of 2 inches in all cases.

The excavated concrete shall be disposed of by the Contractor as specified in Subsection 3.13.

(2) <u>Patch Area Preparation for Type A and B Partial-Depth Concrete Repairs.</u> The pavement areas indicated to receive Type A or B partial depth repairs shall be saw-cut to neat lines perpendicular or parallel to the roadway centerline and a minimum of 2 inches outside the surface area of the deteriorated pavement. The saw-cuts will be to a depth of 2 inches. These saw-cuts shall not be paid for directly, but shall be considered subsidiary to bid item "Partial Depth Repair Preparation (Type A or B)".

The Contractor shall remove a 2-inch thickness of concrete from within the perimeter of the saw-cuts using a pneumatic chipping hammer (30 lb. max). The use of a carbide tooth milling machine is not allowed. After the initial 2 inches of concrete have been removed, the Contractor shall continue the downward removal until sound, clean concrete is exposed. The remaining edges should be as near to vertical as possible.

After the initial removal of deteriorated material, the Contractor shall use a steel-faced hammer or steel chain drag to check for unsound concrete below the bottom of the removal line and continue removing material if unsound concrete is detected. If unsound concrete is encountered to a depth greater than t/3 in more than 50% of the designated patch area, the Engineer will determine if the area is suitable for partial depth patching or if it will be repaired as a full depth concrete repair.

Once the deteriorated concrete has been fully removed, the exposed edges and surfaces of the existing concrete shall be sandblasted, cleaned, and free of dust or loose particles.

(3) <u>Patch Area Preparation for Type C Partial-Depth Concrete Repairs</u>. The preparation of pavement areas indicated to receive Type C partial-depth pavement repairs shall be completed in the manner specified for Type A and B repairs except that:

- i. Saw-cutting of a perimeter around the patch area is not required (but allowed),
- ii. The use of a carbide tooth milling machine is allowed, and,
- iii. Vertical edges may be near vertical and rough.

(4) <u>Preparing to Pour the Patch Material.</u> The Contractor shall seek the Engineer's approval of the partial depth repair preparation prior to proceeding with the placement of patching material. When a partial depth concrete pavement repair will abut an edge of an asphalt or aggregate shoulder, that edge must be formed.

i. <u>Preparing to Pour Type A Patches.</u> Type A pavement patches shall consist of the materials specified in Subsections 5.07 A. (1) and 5.07 B. Where preformulated manufactured rapid-set concrete materials are used, the patch area shall be prepared and the mixed material shall be poured in accordance with the manufacturer's recommendations.

Regardless of the material used for the Type A patch, at a minimum, the existing concrete surfaces shall be pre-wetted to a surface-saturated-dry state without standing water in the patch, and an epoxy bonding agent or other approved concrete adhesive shall be applied to the upper 2 inches of the existing vertical surfaces to seal the patch.

ii. <u>Preparing to Pour Type B Patches.</u> Type B pavement patches shall consist of the materials specified in Subsections 5.07 A. (2) and 5.07 B. Immediately prior to pouring the Type B patch material, the existing concrete surfaces shall be prewetted to surface-saturated-dry state without standing water in the patch, and an epoxy bonding agent or other approved concrete adhesive shall be applied to the upper 2 inches of vertical surfaces to seal the patch.

iii. <u>Preparing to Pour Type C Patches.</u> Type C pavement patches shall consist of the materials specified in Subsections 5.07 A. (3) and 5.07 B. Immediately prior to pouring the Type C patch material, the existing concrete surfaces shall be pre-

wetted to a surface-saturated-dry state without standing water in the patch. The Contractor shall install either: 1) an epoxy bonding agent to the vertical surfaces, or 2) a 2:1.25 ratio of Portland cement to water slurry, brushed in to vertical and horizontal surfaces. If such Portland cement slurry is used, it shall be placed immediately prior to placement of concrete and shall not be allowed to dry or gain a partial set. If the slurry dries or sets, concrete shall not be placed until the patch is re-sandblasted clean of the dry slurry.

(5) <u>Pouring, Consolidating, and Finishing Partial-Depth Concrete Patches.</u> The Contractor shall place and consolidate the specified concrete in the areas prepared for patching, strike off the concrete flush with the surface of the existing pavement and finish the patch, all as specified in Subsection 5.05 C. Where pre-formulated manufactured rapid set patch material is used, pouring, consolidation and finishing shall be as per the manufacturer's recommendations. The repair's surface texture should be similar to that of the surrounding existing pavement.

(6) Jointing of Partial-Depth Concrete Patches. Transverse and longitudinal joints shall be constructed in the patches in line with joints in the adjacent pavement, at the location of the original joints, or at locations determined by the Engineer. Joints shall not be constructed at the patch edges unless the patch edge is the edge of the slab being repaired. All joints, including joints in patches that will be overlaid, shall be sawed, cleaned, and sealed with the materials and in the manner specified in Subsection 5.05. Transverse and longitudinal control joints within or around partial depth pavement repairs shall not be paid for directly, but shall be considered subsidiary to the bid item "Partial Depth Concrete Pavement Repair (Type #)."

(7) <u>Curing of Partial-Depth Concrete Patches.</u> Unless otherwise directed by the Engineer, concrete repairs shall be cured by applying liquid membrane compound at the rate of 1 gallon per 150 square feet as specified in Subsection 5.01 F. In the event that an asphalt overlay or Reflective Crack Interlayer (RCI) overlay is to be subsequently placed over the patch, plastic shall be used for curing and a liquid membrane is not allowed. Plastic shall be anchored to provide a complete seal over the concrete to the specified curing period and not distort the concrete while the concrete is in a pliable state.

(8) <u>Pavement Protection and Weather Limitations.</u> Fresh concrete shall be adequately protected from heavy rains and mechanical injury including vandalism. No construction traffic shall be permitted to use fresh concrete pavement unless approved by the Engineer. The weather limitations set forth in Subsections 5.01 E (5) and (6) shall apply.

(9) <u>Opening to Traffic.</u> Partial depth concrete repairs shall not be opened to vehicular traffic until the strength requirements set forth in Table 5.05 C (16) are satisfied.

D. <u>Basis Of Acceptance</u>. Completed Partial-Depth Concrete Pavement Repairs shall be accepted based upon strength, surface trueness, and surface condition.

(1) <u>Strength.</u> Completed Partial-Depth Concrete Pavement Repairs shall be accepted for strength based upon the requirements and test methods set forth in Subsection 5.01 D
 (5) and (6). A set of test cylinders will be produced at least once per week as the repairs are being made. At the Engineer's discretion, concrete that fails to meet these

requirements shall be either removed and replaced with suitable concrete at the Contractor's expense, or may remain in place without being measured or paid for.

(2) <u>Surface Trueness.</u> The pavement surface and edges shall be true to the lines and grades shown in the Project Documents. The pavement cross slope shall be maintained.

The pavement surface may be checked by the Engineer using a 10-foot straightedge at selected locations at the Engineer's discretion. The maximum allowable variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed 1/4 inch. Corrections to pavement not meeting requirements shall be made using an approved profiling device or by removing and replacing the pavement. Bush hammers or other impact devices will not be permitted. Where surface corrections are made, the Contractor shall establish a uniform texture the full width of the lane. However, transverse grooving will not be required. Any areas with surface variations greater than the maximum allowable shall be corrected at the expense of the Contractor.

(3) <u>Surface Condition</u>. The Contractor shall thoroughly clean the concrete repair area adjacent pavement, gutters and curbs prior to opening to traffic. The Contractor shall repair or remove and replace any damaged pavement or broken pavement repairs, spalls, uncontrolled cracks, honeycombs, grooves, gouges or otherwise defective pavement. Defective concrete shall be repaired to the satisfaction of the Engineer or the defective concrete pavement removed and replaced. The repair or removal and replacement of defective pavement shall be entirely at the Contractor's expense

E. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

PARTIAL-DEPTH CONCRETE REPAIR (TYPE #)Unit: Square Yard
(nearest 0.1 S.Y.)

(#) Type A, B, or C partial-depth concrete repair as specified in Project Documents

(2) <u>Measurement.</u> "Partial-Depth Concrete Repair Preparation (Type #)" shall be measured by the surface area of patch material installed. If unsound concrete is encountered to a depth of 4 inches or greater in more than 50% of the designated patch area, the Engineer will determine if the area is suitable for partial depth patching or if it will be repaired as a full depth concrete repair. If the Engineer determines a full depth repair is necessary, the surface area of the repair area shall be measured and 50% of this area will be paid for as "Partial Depth Concrete Repair (Type #)." Additional measurement and payment will be made under "Full Depth Concrete Repair."

(3) <u>Payment.</u> Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed, converted and rounded to the nearest 0.1 square yard for each Application for Payment.

"Partial-Depth Concrete Repair (Type #)", measured as provided above shall, be made at the respective Contract Unit Price. Such payments shall be full compensation for sawing of concrete, removal of deteriorated concrete, disposal, sandblasting and cleaning of the patch repair area, furnishing and mixing of the concrete repair materials, furnishing and installing forms, joints, joint sealant, and curing compound, and the mixing, transporting, pouring, consolidating, finishing, texturing, jointing, tooling, sawing, curing, protecting, and testing of the concrete, mobilization, and; providing all traffic control, unless provided by the owner or established as a separate pay item; and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

5.08 FULL-DEPTH CONCRETE PAVEMENT REPAIR

A. <u>Materials.</u> Materials incorporated into the construction of full-depth concrete repairs shall meet all of the requirements of Subsection 5.01 and the requirements specified as follows:

(1) <u>Concrete</u>. Concrete for full depth concrete repairs shall be Pavement Class-A concrete unless otherwise approved by the Engineer.

- (2) <u>Forms.</u> Forms shall be as specified in Subsection 5.02.
- (3) <u>Reinforcing Steel.</u> Reinforcing steel, welded wire fabric, dowel bars, and tie bars shall be as specified in Subsection 5.03.
- (4) <u>Fiber Reinforcement</u>. If specified in the Project Documents or approved by the Engineer, fiber reinforcement shall be as specified in Subsection 5.01 B (5).
- (5) <u>Curing Compound.</u> Curing compound shall be as specified in Subsection 5.01 B
 (6).
- (6) <u>Expansion Joint Material.</u> Expansion joint filler material shall be as specified in Subsection 5.05 B (4).
- (7) Joint Sealant. Joint Sealant shall be as specified in Subsection 5.05 B (5).

B. Construction Requirements.

(1) Excavation for Full-Depth Concrete Repair. The Engineer shall mark in the field the limits of the deteriorated concrete pavement to be removed and replaced. The minimum patch length for full-depth concrete pavement repairs shall be six feet in the longitudinal direction and the full extent of one lane in the transverse direction, unless otherwise directed or approved by the Engineer. Where a full-depth repair is to be made where a partial-depth repair was started, the limits of the full-depth repair shall be defined by the Engineer before the Contractor commences with excavation for the full-depth repair.

The location of existing joints in the concrete pavement shall be referenced before removing the deteriorated pavement.

The deteriorated concrete pavement shall be isolated from the adjacent sound concrete with a full-depth saw-cut around the perimeter of the patch area. The deteriorated concrete pavement shall be lifted out of place wherever possible. If lifting is unsafe or not possible, then the pavement shall be broken up and removed mechanically or by hand. Care should be taken to not damage the remaining pavement. The excavated concrete shall be disposed of by the Contractor as specified in Subsection 3.13.

i. <u>Removal of Pavement Containing Bricks (Projects within the City Limits</u> <u>Only)</u>. If the area to be patched has one or more underlying layers of brick, the requirements of Subsection 4.05 and the City of Topeka Brick Street, Alley and Sidewalk Policy shall apply. Upon encountering pavement containing bricks, the Contractor shall contact the City Street Maintenance Section and request instruction relative to preservation of the brick. The Contractor shall not proceed with any excavation of pavement containing brick until authorization from the Street Maintenance Section is received.

After the authorization to proceed has been received from the Street Maintenance Section, the Contractor may proceed with removal of bricks as specified in Subsection 4.05 and using care to not damage the bricks. The bricks shall be salvaged to the Street Maintenance Section as specified in Subsection 4.05.

(2) <u>Subgrade Preparation</u>. After removal of the pavement, the Contractor shall request an inspection of the subgrade by the Engineer. If the Engineer determines that the subgrade is unstable, it shall be excavated to a depth determined by the Engineer and backfilled with Aggregate Base Type AB-3 as specified in Subsection 3.12. The aggregate base shall be moistened and deposited in lifts not exceeding 6 inches and compacted to a minimum density of 95% of the standard density with moisture content of +/-3% of the optimum moisture or to the satisfaction of the Engineer when testing of the density of the material is waived by the Engineer. The installation and compaction of the aggregate base shall be paid for by the ton under the pay item "Aggregate Base-Type AB-3". Excavation of the subgrade shall be paid for by the cubic yard under the pay item "Unclassified Excavation".

(3) <u>Forms.</u> When a Full-depth concrete pavement repair will abut an edge of an asphalt or aggregate shoulder, that edge must be formed as specified in Subsection 5.02.

(4) <u>Reinforcing.</u> The repair area should be reinforced in the same manner as the area removed.

i. <u>Reinforcing at Transverse Joints.</u> Load transfer within areas of full-depth concrete pavement repair shall be provided at all transverse, butt, and contraction joints, by smooth metal dowels. The dowels shall be installed with their midpoint at the location of the transverse joints, their length perpendicular to the transverse joints, and mid-depth within the slab. Three dowel bars, spaced at 1-foot centers, shall be placed in each wheel path. The dowels shall be 18 inches long and $\frac{1}{2}$ inch diameter for 6-inch thick pavement, 1 inch diameter for 7-inch to 8-inch thick pavements, or 1-1/4 inch diameter for 9-inch and thicker pavements.

Where the transverse face of a full-depth concrete repair abuts existing concrete, a hole 1/8 inch larger than the dowel bar shall be drilled into the existing concrete and the smooth dowels inserted 9 inches into the slab and epoxy grouted in place. The exposed end of the dowel bar should be coated with light grease to facilitate horizontal movement. At transverse butt joints between two full-depth panels poured separately, and at transverse contraction joints, the dowels shall be supported by metal chairs or dowel baskets.
ii. <u>Reinforcing at Longitudinal Joints.</u> Full-depth concrete pavement repairs shall have 3 foot by ½ inch diameter deformed tie-bars provided at 5-foot centers along all longitudinal joint faces at the slabs mid-depth. Where the longitudinal face of a full-depth concrete repair abuts existing concrete, a hole 1/8 inch larger than the tie bar shall be drilled into the existing concrete, and the tie bar inserted 18 inches into the slab and epoxy grouted in place. At longitudinal joints between two full-depth panels poured separately the tie bars shall be supported by metal chairs.

(5) <u>Pouring, Consolidating, and Finishing Full-Depth Concrete Patches.</u> The Contractor shall place and consolidate the specified concrete in the areas prepared for patching, strike off the concrete flush with the surface of the existing pavement and finish the patch, all as specified in Subsection 5.05 C. Full-depth repairs with a length longer than 10 feet shall be finished longitudinally using a vibratory screed. Full-depth repairs with a length of 10 feet or less shall be finished transversely using a 10-foot straight edge. The repair's surface texture should be similar to that of the surrounding existing pavement.

(6) <u>Jointing of Full-Depth Concrete Patches.</u> Transverse and longitudinal joints shall be constructed in the patches in line with joints in the adjacent pavement, at the location of the original joints, or as directed by the Engineer. All joints, including joints in patches that will be overlaid, shall be sawed, cleaned, and sealed with the materials and in the manner specified in Subsection 5.05. Transverse and longitudinal control joints within or around full-depth concrete pavement repairs shall not be paid for directly, but shall be considered subsidiary to the bid item_ "Full-Depth Concrete Pavement Repair".

(7) <u>Curing of Full-Depth Concrete Patches.</u> Unless otherwise directed by the Engineer, concrete repairs shall be cured by applying liquid membrane compound at the rate of 1 gallon per 150 square feet as specified in Subsection 5.01 F. In the event that an asphalt overlay or Reflective Crack Interlayer (RCI) overlay is to be subsequently placed over the patch, liquid membrane shall not be allowed, but plastic shall be used for curing. Plastic shall be anchored to provide a complete seal over the concrete during the specified curing period and shall not distort the concrete while the concrete is in a pliable state.

(8) <u>Pavement Protection and Weather Limitations.</u> Fresh concrete shall be adequately protected from heavy rains and mechanical injury including vandalism. No construction traffic shall be permitted to use fresh concrete pavement unless approved by the Engineer. The weather limitations set forth in Subsections 5.01 E (5) and (6) shall apply.

(9) <u>Opening to Traffic.</u> Full-depth concrete patches shall not be opened to vehicular traffic until the strength requirements set forth in Table 5.05 C (16) are satisfied.

C. <u>Basis Of Acceptance.</u> Completed Full-Depth Concrete Repairs shall be accepted based upon strength, surface trueness, and surface condition.

(1) <u>Strength.</u> Completed Full-Depth Concrete Pavement shall be accepted for strength based upon the requirements and test methods set forth in Subsection 5.01 D (5) and (6) except when modified as follows: A set of test cylinders will be produced at least once per every 50 cubic yards of concrete poured or at least once per week as the repairs are being made, whichever is more frequent. At the Engineer's discretion, concrete that fails

to meet these requirements shall be either removed and replaced with suitable concrete at the Contractors expense, or may remain in place without being measured or paid for.

(2) <u>Surface Trueness</u>. The pavement surface and edges shall be true to the lines and grades shown in the Project Documents. The pavement cross slope shall be maintained.

The pavement surface may be checked by the Engineer using a 10-foot straightedge at selected locations at the Engineer's discretion. The maximum allowable variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed 1/4 inch. Corrections to pavement not meeting the specified smoothness and trueness requirements as determined by straightedge testing, shall be made using an approved profiling device or by removing and replacing the pavement. Bush hammers or other impact devices will not be permitted. Where surface corrections are made, the Contractor shall establish a uniform texture the full width of the lane. However, transverse grooving will not be required. Any areas with surface variations greater than the maximum allowable shall be corrected at the expense of the Contractor. Corrective action shall be completed at the Contractor's expense.

(3) <u>Surface Condition.</u> The Contractor shall thoroughly clean the concrete repair area adjacent pavement, gutters and curbs prior to opening to traffic. The Contractor shall repair or remove and replace any damaged pavement or broken pavement repairs, spalls, uncontrolled cracks, honeycombs, grooves, gouges or otherwise defective pavement. Defective concrete repairs shall be repaired to the satisfaction of the Engineer or the defective pavement repairs shall be entirely at the Contractor's expense.

D. Bid Item, Measurement and Payment.

(1) Bid Item:

FULL-DEPTH CONCRETE REPAIR Unit: Square Yard (nearest 0.1 S.Y.)

(2) <u>Measurement</u> "Full-Depth Concrete Repair" shall be measured by the surface area of the patch material installed. Dimensions of individual patch areas shall be measured to the nearest 0.1 foot, the areas computed, summed, converted and rounded to the nearest 0.1 square yard for each Application for Payment.

If the Engineer determines that a repair area is unsuitable for a partial-depth repair and directs or approves the full-depth repair of an area initially prepared for partial-depth patching, the area of "Full Depth Concrete Repair" shall be measured by the surface area of the patch material installed.

(3) <u>Payment.</u> Payment for completed and accepted "Full-Depth Concrete Repair", measured as provided above, shall be made at the Contract Unit Price. If a repair is initiated as a partial-depth concrete repair but is completed, based upon direction or approval from the Engineer as a Full-Depth Concrete Repair, the area the area shall be measured and paid for as of "Full-Depth Concrete Repair". In addition, 50% of the area will be measured and paid for as "Partial-Depth Concrete Repair (Type #)."

Such payments for "Full-Depth Concrete Repair" shall be full compensation for sawing of concrete, removal of deteriorated concrete, subgrade excavation, disposal, furnishing

and mixing of the concrete repair materials, furnishing and installing forms, joints, reinforcement, joint sealant, curing compound and epoxy grouting; the pouring, consolidating, finishing, texturing, jointing, tooling, curing, protecting, and testing of the concrete; and providing all traffic control, unless provided by the owner or established as a separate pay item; and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

5.09 FLOWABLE FILL

A. <u>Materials.</u> Flowable fill shall consist of portland cement, fly ash, water, fine aggregate and, at the Contractor's option, accelerators. All materials shall meet the requirements of Subsection 5.01.

B. <u>Flowable Fill Proportioning and Strength Requirements.</u> Flowable fill shall be self-leveling. The 28 day compressive strength shall be equal to or greater than 50 psi but shall not exceed 150 psi, to permit future excavation. The mix design shall be designed and tested by the suppliers, but shall conform to the following requirements unless approved otherwise by the Engineer:

Cement:	50 lbs./CY
Fly Ash:	240 lbs./CY
Fine Aggregate:	2600-2800 lbs./CY
Entrained Air:	5%-16%
Unit Weight:	116-125 pcf
w/c ratio:	0.85-1.21

C. Mixing, Delivery, and Placement.

(1) <u>Mixing.</u> All flowable fill shall be ready-mixed.

(2) <u>Conveying</u>. The normal method of transporting concrete shall be via ready-mix truck.

(3) <u>Delivery Tickets.</u> A delivery ticket shall be provided to the Engineer's Representative with each flowable fill load. The ticket shall contain the following information: plant name, proportioning of the flowable fill, and number of cubic yards of flowable fill batched.

(4) Placement. The Contractor shall deposit the flowable fill as nearly as practicable in its final position. Place the flowable fill in the excavation so all voids around the structure or in the excavation are filled. Place the flowable fill in lifts and rake as necessary to aid leveling and prevent the buildup of excess hydrostatic pressure.

D. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

FLOWABLE FILL

Unit: Cubic Yard (nearest 1 C.Y.)

(2) <u>Measurement.</u> "Flowable Fill" shall be measured by the in-place volume of the material. The dimensions of individual areas filled shall be measured to the nearest 0.1

foot, the volumes computed by the average end area method and rounded to the nearest 1 cubic yard for each Application for Payment.

(3) <u>Payment.</u> Payment for completed and accepted "Flowable Fill", measured as provided above, shall be made at the respective Contract Unit Price. Such payments shall be full compensation for furnishing and mixing of the materials, furnishing and installing forms, placing pouring, consolidating, finishing, mobilization and providing all traffic control, unless provided by the owner or established as a separate pay item, and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified.

END OF SECTION

SECTION 6

SEWERS AND CULVERTS

6.01 GENERAL.

A. <u>Scope</u>. This section covers the construction of all storm sewers, drainage culverts, sanitary sewers, manholes, inlets, reinforced concrete sewer structures, and other related appurtenances.

B. <u>General Construction Requirements.</u> Pipelines and culverts shall be constructed using the type of pipe material specified in the Project Documents and meeting the requirements of these Standard Specifications. Pipes may be designated by their use. Pipes used in an enclosed drainage system may be referred to as "Storm Sewer." Pipes used for conveying open channel and ditch drainage under roadways or entrances may be referred to as "Culverts."

Pipe shall be inspected before it is laid and any defective or damaged lengths shall not be accepted. If metallic pipes or End Sections have been damaged or scratched and the Engineer determines they are otherwise acceptable, the Contractor shall clean the damaged area by blast cleaning, disk sanding, or wire brushing, and paint the clean damaged area with a zinc rich paint.

Pipe shall be laid in the finished trench to a true and uniform grade as shown in the Project Documents. Bedding shall conform to the requirements of Subsection 2.08. All pipes shall be laid with ends abutting and true to line and grade. Pipes shall be fitted and matched so that when laid together they will form a smooth and uniform invert.

When bell and spigot pipe is used, bell and spigot ends shall be carefully cleaned before pipes are lowered into the trenches. Construction of gravity sewers shall begin at the lower end with bell ends facing upstream, and with bell holes excavated as required.

The downstream end of new sewer extensions shall be plugged in a positive manner satisfactory to the Engineer until construction, cleaning, and testing are completed and the new construction is accepted by the Owner.

The Contractor shall take all precautions to ensure adequate trench ventilation and protection for workers installing the pipe.

C. <u>Construction Loads</u>. Construction loads on sewers and culverts may exceed the final design loads. The Contractor shall protect sewers and culverts from excessive loading due to the Contractors construction activities and shall repair or replace any sewers or culverts so damaged.

6.02 CRITICAL AREAS FOR WORK WITHIN THE CITY LIMITS.

All storm sewer and drainage culverts within "Critical Areas" shall be made with reinforced concrete. "Critical Areas" are defined as the area upon which curb and gutter or pavement is to be placed. The critical area for streets shall extend one foot on each side beyond the back of curb, edge of pavement, or edge of shoulder, whichever is greater. This requirement does not apply to areas outside the corporate limits of the City of Topeka.

6.03 STORM SEWERS, DRAINAGE CULVERT PIPES, AND END SECTIONS

A. <u>Materials.</u> Pipes used as drainage culverts and storm sewers shall be limited to only those materials listed in paragraphs (1), (2), and (3) below unless otherwise specifically specified in the Project Documents or approved by the Engineer.

(1) <u>Reinforced Concrete Pipe.</u> Round reinforced concrete pipe (RCP) shall conform to the requirements of ASTM C76 wall "B" or "C". Joints shall be slip joints. Pipe supplied shall conform to the requirements of the ASTM pipe classes specified in the Project Documents. Concrete pipe 15" through 30" shall be fabricated without lift holes. Concrete pipe larger than 30" may be fabricated with lift holes.

(2) <u>Reinforced Concrete Pipe Horizontal Elliptical.</u> Elliptical shaped reinforced concrete pipe designed for placement of the major axis in the horizontal direction referred to as "Reinforced Concrete Pipe Horizontal Elliptical" (RCPHE) supplied shall meet the requirements of ASTM C 507 for the ASTM pipe classes specified in the Project Documents. Joints shall be slip joints. All elliptical pipes may be fabricated with lift holes.

(3) <u>Corrugated Steel Pipe and Corrugated Steel Pipe Arch.</u> Corrugated Steel Pipe (CSP) and Corrugated Steel Pipe Arch (CSPA) shall be helically corrugated pipe meeting the requirements of AASHTO M36 and ASTM A760. The CSP material shall be Aluminized Steel Type 2 meeting the requirements of, AASHTO M274 and ASTM A929. All accessories shall be compatible with the pipe supplied and AASTO M36. The pipe sizes, corrugations, and gauges shall be as specified in the Project Documents. Should the Project Documents make reference to "Corrugated Metal Pipe" or "CMP", it shall mean Corrugated Steel Pipe as specified in this paragraph. Joints shall be either Hugger-type or Bell and Spigot.

i. <u>Bell and Spigot Joints.</u> Bell and spigot joints shall be "CONTECH Quick Stab Joint", or an approved equal, for pipe sizes 15" through 48" diameter.

ii. <u>Hugger-type joints.</u> Hugger-type Joints shall conform to "CONTECH Hugger Band", or an approved equal, for pipe sizes 15" and larger.

(4) <u>End Sections.</u> End Sections shall be the same material as the pipe to which it will be connected unless otherwise indicated in the Project Documents. If the Project Documents make reference to "Corrugated Metal Pipe" or "CMP" End Sections, it shall mean Corrugated Steel Pipe as specified in this paragraph.

- i. End Section Designations.
 - (1) End Section (RC) Round reinforced concrete End Section
 - (2) End Section (RCHE) Elliptical (horizontal major axis) reinforced concrete End Section

(3) End Section (CS) - Round corrugated Aluminized Steel Type 2 End Section

(4) End Section (CSA) - Arched corrugated Aluminized Steel Type 2 End Section

(5) <u>Joint Sealants for RCP and RCPHE</u>. Joints in concrete pipes 24-inch diameter and smaller shall be sealed using a preformed mastic sealant conforming to the requirements of

AASHTO M 198 and pre-approved by the Engineer. Mastic sealant must be designed to fit the type of pipe joint for which it is to be used. Joints in concrete pipes larger than 24 inches shall be sealed using approved preformed mastic sealant or cold troweled-on mastic sealant such as Philip Carey "Sewertite" or approved equal.

(6) <u>Lift Hole Plugs.</u> A preformed polyethylene plug shall be used to fill and cover lift holes. The plug shall be *POPIT* manufactured by POPIT Inc., Levittown, PA or an approved equal.

B. <u>Construction Requirements.</u> The full method of construction shall be observed and approved by the Engineer at the start of operations.

(1) <u>Excavation</u>. The Contractor shall excavate the bottom of the channel to the line, grade and elevation shown in the Project Documents beginning at the outlet end and proceeding toward the upper end. Excavation and the width of the trench shall be as specified in Subsection 2.02. If the culvert is being installed in a location where pavement is not otherwise planned for removal or replacement, pavement removal shall be as specified in Subsection 4.06.

The Contractor shall follow all OSHA safety regulations for all excavations and use shoring and bracing as required by Subsection 2.03. Shoring and bracing is subsidiary. Ground water shall be controlled as specified in Subsection 2.04. Trench stabilization shall be a specified in Subsection 2.05.

(2) <u>Bedding</u>. Bedding material shall be placed as specified in Subsection 2.08. Bedding material is subsidiary.

(3) <u>Laying</u>. The Contractor shall lay the pipe as specified in Subsection 6.01 and as per the manufacturer's recommendations. Lines shall be checked for alignment by visual inspection. The pipe between manholes shall not be more than ¹/₄ of the pipe diameter out of alignment.

When placing two pipe culverts parallel to one another, the pipes shall be separated from each other a distance of $\frac{1}{2}$ the diameter of the pipe with a minimum distance between round pipes of 18 inches and a minimum distance between elliptical or arch pipe of 24 inches.

i. <u>RCP and RCPHE</u>. The Contractor shall seal all joints. Prior to sealing, the joints of all pipes shall be visually inspected for the interior joint gap. The maximum allowable gap at any location on the joint shall be ³/₄ inch. If troweled on mastic sealant is used for pipes larger than 24 inches in diameter, mastic shall be placed around the entire inside periphery of the bell and on the outside of the upper half of the spigot. After the spigot is seated completely in the bell, the inside of the joint shall be smoothed and any excess mastic material removed from the inside of the pipes.

ii. <u>CSP and CSPA.</u> When round CSP is installed, where possible the Contractor shall rotate the pipes so that the corrugations match from section to section. CSP and CSPA shall be tightly joined by the use of connecting bands unless bell and spigot pipe is used. Space between the connecting bands and pipe shall be kept free from dirt and grit so that the corrugations fit snugly. Slack in the bands should be taken up by tightening of the bolts.

(4) <u>Stubs and Plugs</u>. Pipes designated in the Project Documents to be plugged for future connections shall be plugged to prevent infiltration, resist deterioration, and permit future reopening without substantial damage to the existing construction. All plugs shall be approved by the Engineer before backfilling. Special fittings, discs, and other devices may be installed with the approval of the Engineer. Such plugging devices shall be installed in accordance with the manufacturer's recommendations.

(5) <u>Backfill and Compaction</u>. Backfill and compaction shall be completed as specified in Subsections 2.09 and 2.10. Backfill and compaction are subsidiary.

(6) <u>Pavement Replacement.</u> Unless otherwise indicated the Project Documents, the Contractor shall replace pavement as specified in Subsection 4.06.

C. <u>Cleaning and Testing</u>. After all installations are complete, including all backfill and compaction, the storm sewer or culvert shall be flushed clear of all foreign materials. Flushing shall be completed in manner complying with the SWPPP and shall not contribute to soil erosion or water pollution.

- D. Bid Items, Measurement and Payment.
 - (1) <u>Bid Items:</u>

Lineal Foot (nearest 1 L.F.)
Lineal Foot (nearest 1 L.F.)
ach
ach
ed steel pipe d concrete rced concrete horizontal tted steel arch
ted s

(##) – Type as specified in the Project Documents

(2) <u>Measurement.</u> The various sizes and types of Storm Sewers and Culverts shall be measured to the nearest one foot along the flow-line of the pipe from end of pipe to end of pipe in inlets, manholes and other structures. Where an End Section is attached to a pipe, the fully enclosed portion of the End Section shall be included in the measured pipe length.

End Sections will be measured per each of the various sizes and types of End Sections.

(3) <u>Payment.</u> The completed and accepted lengths of Storm Sewers and Culverts, measured as specified above, shall be paid for at the Contract unit price per foot for each of the various sizes and types of Storm Sewers and Culverts.

The number of completed and accepted End Sections shall be paid for at the Contract unit price per each of the various sizes and types of End Sections.

Payment, as provided for above, shall be full compensation for all trenching, shoring, backfilling, compaction, furnishing and laying, removal of excess material, dewatering of excavation, cleaning and testing as specified; and for all equipment, tools, labor, and incidentals necessary to complete the work.

6.04 PRECAST REINFORCED CONCRETE BOX STRUCTURES

A. Materials

(1) <u>General.</u> Reinforced Concrete Box (RCB) sections used for culverts or storm sewers shall conform to ASTM C789 and AASHTO M259.

(2) <u>Loading</u>. RCB sections having less than 2 feet of cover and subjected to highway loading shall conform to ASTM C850 and AASHTO M273.

- (3) <u>Reinforcement</u> shall conform to ASTM A185.
- (4) <u>Strength.</u> Minimum concrete strength shall be 5000 psi at 28 days.
- (5) Joints shall be sealed with joint cement or flexible gasket-type sealants.
- (6) <u>Concrete</u> shall conform to the requirements of Section 5.04.

(7) <u>Mortar</u> shall consist of one part Portland Cement and 1½ parts clean sharp sand with only enough water for workability.

(8) <u>Geotextile.</u> Geotextile fabric shall meet the requirements of Section 2210 of the KDOT Standard Specifications.

B. Construction Requirements

The Contractor shall provide excavation and subgrade for precast RCB structures as specified in Subsection 2.02.

Precast RCBs shall be laid with the groove end of each section faced up-grade. Sections shall be tightly joined and sealed according to the manufacturer's recommendations.

When geotextile is used to wrap joints, only geotextile that has been properly stored shall be used. The geotextile's exposure to the elements (between placement and covering) shall be a maximum of seven calendar days. Dropping any backfill larger than six inches in any dimension onto the geotextile from a height greater than one foot and dropping any backfill smaller than six inches in any dimension onto the geotextile from a height greater than one foot and dropping any backfill smaller than six inches in any dimension onto the geotextile from a height greater than three feet shall be avoided.

The geotextile shall not be contaminated with grease, mud, or other foreign substances. Replace contaminated or damaged geotextile.

Lifting holes shall be filled with precast plugs and sealed with mastic or mortar.

Precast RCB sections shall be checked for alignment with appropriate surveying equipment. The alignment shall meet the full intent of the Project Documents at all points of horizontal and vertical control. At locations between control points, a maximum horizontal variation in alignment of one foot may be allowed if, in the opinion of the Engineer, the misalignment causes no adverse effect.

Headwalls and/or wingwalls shall be either cast in place or pre-cast concrete meeting the requirements for concrete structures as specified in Subsection 5.04. Headwalls and wingwalls for pre-cast RCB's are subsidiary to the pre-cast RCB.

Backfill of the precast RCB structure shall be completed as specified in Subsection 2.10

C. Bid Item, Measurement and Payment

(1) Bid Item:

(*)FT. x (*)FT. x (*)FT. PRECAST REINFORCED CONCRETE BOX

Unit: Lineal Foot (nearest 1 L.F.)

(*) - Dimension of box

(2) <u>Measurement.</u> Precast RCBs shall be measured along centerline of the floor of the RCB to the nearest lineal foot from end to end of the structure.

(3) <u>Payment</u> will be made at the unit price bid per foot for each size box placed and accepted, which price shall include trenching, shoring, backfilling, compaction, furnishing and laying, joints, removal of excess material, dewatering of excavations as specified; and all materials, labor, equipment, tools, and incidentals necessary to complete the work.

6.05 SANITARY SEWERS

- A. <u>Materials.</u> Sanitary sewer pipelines shall be one of the following types as indicated in the Project Documents:
 - Ductile Iron Pipe (DIP),
 - Polyvinyl Chloride Pipe (PVCP), or
 - Vitrified Clay Pipe (VCP)

(1) <u>Ductile Iron Pipe Materials.</u> DIP may be "Push-on" or "Mechanical Joint" and shall conform to ANSI/AWWA C151/A21.51.

i. <u>General.</u> Unless otherwise indicated in the Project Documents, required by trench load, or required by internal working pressure, all 4 inch DIP shall be Class 51 and all 6 inch and larger DIP shall be Class 50. Thickness design of DIP shall be in accordance with ANSI/AWWA C150/A21.50.

ii. <u>Mechanical Joint and Flanged Fittings</u>. The requirements of ANSI/AWWA C110/A21.10 shall apply to all mechanical joint and flanges fittings.

iii. <u>Lining.</u> Unless otherwise specified or indicated in the Project Documents, all DIP and fittings, except pipe and fittings for sanitary sewer service, shall be coated and lined with the manufacturer's standard asphaltic material. Coating and lining shall conform to the requirements of ANSI/AWWA C151/A21.51.

Pipe and fittings for sanitary sewer service shall be lined with either Protecto 401 ceramic epoxy or polyethylene. The Protecto 401 or polyethylene lining on all pipe barrels and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Any defects found shall be repaired prior to shipment. The lining thickness shall be checked using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating. The Contractor shall submit to the Engineer a manufacturer's certificate or catalog cut showing that the pipe supplied complies with the specifications.

(1) <u>Protecto 401 Ceramic Epoxy.</u> The lining material shall be amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Lining shall have a nominal dry film thickness of 40 mils. In no case shall the lining thickness be less than 30 mils.

(2) <u>Polyethylene</u>. The lining material shall be virgin polyethylene complying with ANSI/ASTM D 1248, shall be heat-bonded to the interior of the pipe or fitting, and shall have a nominal thickness of 40 mils. In no case shall the lining thickness be less than 30 mils.

iv. <u>Mechanical Joint Pipe.</u> All bolts, glands, and gaskets for mechanical joint pipe and fittings shall conform to ANSI/AWWA C111/A21.11.

v. <u>Flanged Joints.</u> Flanged joints shall conform to ANSI/AWWA C115/A21.15. Flanges shall be ductile iron, flat faced, and of solid construction. The use of hollow-back flanges will not be permitted. Flanged gaskets shall be neoprene, 1/8 inch thick, full-face type. Flange bolts shall conform to ASTM A307 with chamfered or rounded ends and shall project 1/4 to 1/2 inch beyond the outer face of the nut. Nuts shall be hexagonal ANSI/ASME B18.2.2 heavy semi-finished pattern, conforming to ASTM A307.

vi. <u>Encasing.</u> Unless otherwise specified or indicated in the Project Documents, all buried ductile iron pipe and fittings shall be encased in seamless, 8 mil polyethylene tubes conforming to ANSI/AWWA C105/A21.5.

(2) Vitrified Clay Pipe Materials.

i. <u>Pipe.</u> All vitrified clay pipe (VCP) shall meet the requirements of ASTM C700.

ii. <u>Joints.</u> VCP compression joints shall conform to the requirements of ASTM C425.

iii. <u>Couplings</u>. VCP compression couplings shall conform to the requirements of ASTM C425.

(3) Polyvinyl Chloride (PVC) Pipe Materials.

i. <u>Pipes and Fittings.</u> PVCP shall be made of PVC plastic having a cell classification of 12454-B or 12454-C as defined in ASTM D1784. PVCP and fittings shall meet the requirements tabulated in Table 6.04 A (3) i.

Table 6.04 A (3) 1. – PVC Pipe and Fitting Material Requirements		
Nominal Pipe Size	Specified Requirements of Pipes and Fittings	
4" through 6"	ASTM D2665 (schedule 40 wall thickness)	
8" through 15"	ASTM D3034 SDR 26	
18" through 36"	ASTM F679 - PS 46	

Table 6.04 A (3) i. – PVC Pipe and Fitting Material Requirements

ii. <u>Joints, Gaskets and Solvent Cement.</u> PVCP push-on joints shall conform to ASTM D3212. PVCP gaskets shall conform to ASTM F477. Solvent cements for joining PVC pipe and socket-type fittings shall conform to ASTM D2564.

(4) <u>Riser Pipes.</u> Riser pipes shall be constructed of approved sewer pipe and fittings as shown in the Project Documents or as approved by the Engineer.

B. <u>Construction Requirements.</u> The full method of construction shall be observed and approved by the Engineer at the start of operations.

(1) <u>Protection of Water Supplies.</u> Sewer lines constructed of DIP with polyethylene or Protecto 401 lining or, PVCP may be constructed within 10 feet of a private water supply well provided a length of pipe is centered on the well. All other sewer lines must be at least 50 feet from a private water supply well. Where a gravity sanitary sewer line is laid parallel with a water line, the horizontal distance between them shall be 10 feet, measured from edge of pipe to edge of pipe. The sewer and the water line shall be laid in separate trenches with undisturbed earth between them.

Where sanitary sewer lines cross water lines, the sewer line shall be either DIP with a polyethylene or Protecto 401 lining or, PVCP. One 20 foot length of pipe shall be centered on the crossing, or, if a 20 foot length of pipe is not available, the sewer may be encased in concrete for 10 feet either side of the water line. Encasement shall be as shown on the Sanitary Sewer Standard Detail Sheet. Where the water line is at least 2 feet above the sewer, the requirements of this paragraph shall not apply.

(2) <u>Trench Excavation</u>. The Contractor shall excavate the bottom of the trench to the line, grade and elevation shown in the Project Documents beginning at the outlet end and proceeding toward the upper end. The excavation and the width of the trench shall be as specified in Subsection 2.02. If the sanitary sewer is being installed in a location where pavement is not otherwise planned for removal or replacement, pavement removal shall be as specified in Subsection 4.06.

The Contractor shall follow all OSHA safety regulations for all excavations and use shoring and bracing as required by Section 2.03. Shoring and bracing is subsidiary. Ground water shall be controlled as specified in Subsection 2.04. Trench stabilization shall be a specified in Subsection 2.05.

(3) <u>Bedding</u>. Bedding material shall be placed as specified in Subsection 2.08. Bedding material is subsidiary.

(4) <u>Laying</u>. The Contractor shall lay the pipe as specified in Subsection 6.01 and as per the manufacturer's recommendations.

i. <u>Laying Ductile Iron Pipe.</u> DIP shall be installed in accordance with the Project Documents. The Contractor has the option to use mechanical, push-on, or flanged joints, except that flanged joints are not be permitted in any underground location.

(1) Mechanical Joints. The Contractor shall clean the inside of the bell and 8 inches of the spigot end of pipe and coat the ends with a soap solution ($\frac{1}{2}$ cup granulated soap per gallon of water) or other approved lubricant. The Contractor shall place the gland and rubber gasket on the spigot and seat the spigot in the bell. The Contractor shall press the gasket and gland into place, set bolts and initially tighten nuts by hand until further tightening by hand cannot be accomplished. Nuts shall be tightened on opposite sides of joint alternately. Final tightening of nuts shall be completed with torque limiting wrench set in accordance with the following table:

Bolt Size (Inches)	Range of Torque (ft./lb.)
5/8	40 - 60
3⁄4	60 - 90
1	70 - 90

90 - 120

(2) <u>Push-on Joints.</u> Construction of push on joints shall be in accordance with the recommendations of the manufacturer. Gaskets shall be placed on the pipe before the pipe is lowered into the trench.

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(3) <u>Flanged Joints.</u> Flanged gaskets shall be placed and flanged pipes shall be joined in such a manner as to not damage either the flange facing or the gasket. Flanged pipe joints shall be cleaned, assembled and tightened with a torque wrench to the ranges specified for mechanical joints in Subsection 6.05 B (4).

(4) Encasement. Unless otherwise specified or indicated in the Project Documents, all buried DIP and fittings shall be encased in seamless, 8 mil polyethylene tubes. Ends of polyethylene tubing shall be overlapped at least 12 inches and shall be thoroughly sealed with polyethylene adhesive tape. All cuts, tears, punctures, or other damage to the polyethylene shall be repaired by the Contractor using approved polyethylene adhesive tape or with a short length of polyethylene sheet or tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

ii. <u>Laying Vitrified Clay Pipe.</u> VCP with resilient material joints shall be installed in accordance with the manufacturer's recommendations and in accordance with the Project Documents. All joints shall be wiped clean as the work progresses. Exposed ends of VCP shall be protected from damage and shall be plugged or covered to prevent entry of obstructing matter. Joints in VCP shall not be covered until inspected and approved by the Engineer.

iii. <u>Laying PVC (Polyvinyl Chloride) Pipe.</u> PVCP shall be installed in accordance with ASTM D2321 and in accordance with the Project Documents. Installations of solvent weld joint pipe and fittings shall be made in accordance with ASTM F402.

iv. <u>Service (Wye) Connections.</u> The Contractor shall install wye fittings for service connections at the locations shown in the Project Documents and approved by the Engineer. Wyes shall be located a minimum distance of 5' from manholes. Wyes for all types of pipe shall be installed as recommended by the manufacturer and approved by the Engineer. Concrete cradles will not be required under wyes when PVCP is used.

v. <u>Riser Pipes.</u> The Contractor shall install riser pipes at the locations shown in the Project Documents and as identified by the Engineer. Each riser pipe shall be plugged with an approved plugging device.

vi. <u>House Service Lines.</u> The Contractor shall construct house services lines as detailed in the Project Documents. Connections between new and old work shall be made by means of suitable adapters and/or in a manner satisfactory to the Engineer. Service line connections directly into manholes shall be prohibited, unless approved in advance by the Engineer.

vii. <u>Abandonment of House Service Lines or Wye Connections</u>. House service lines or wye connections to be abandoned shall be plugged at the property line with an approved plugging device. Following installation of the plugging device, the plugged end of the service line shall be encased in concrete. The concrete encasement shall extend outward from the plugging device 4 to 6 inches in all directions. Abandoning house service lines or wye connections as specified above is subsidiary to other items of the Contract.

viii. <u>Stubs and Plugs.</u> Pipes designated in the Project Documents to be plugged for future connections shall be plugged to prevent infiltration, resist deterioration, and permit future reopening without substantial damage to the existing construction. All plugs shall be approved by the Engineer before backfilling.

Special fittings, discs, and other devices may be installed with the approval of the Engineer in accordance with the manufacturer's recommendations. Plugging of stubs and other pipes as specified above is subsidiary to other items of the Contract.

(5) <u>Backfill and Compaction</u>. Backfill and compaction shall be completed as specified in Subsections 2.09 and 2.10.

(6) <u>Pavement Replacement</u>. Unless otherwise indicated in the Project Documents, the Contractor shall replace pavement as specified in Subsection 4.06.

C. <u>Cleaning and Testing of Sanitary Sewers.</u>

(1) <u>Cleaning</u>. The Contractor is responsible for the cleaning of sanitary sewers and manholes. After installation of sewers is complete, including all backfill and compaction, the sewer shall be flushed clear of all foreign material. Flushing shall be completed in manner complying with the SWPPP and shall not contribute to soil erosion or water pollution.

All debris shall be removed from manholes immediately following the structure's construction. All lift holes shall be plugged with non-shrink grout prior to testing. Vacuum or hydrostatic testing of manholes is recommended prior to backfilling to assist in locating leaks. However, the final test and acceptance of manholes shall be based only on tests completed after the manholes are backfilled.

(2) <u>Testing</u>. Testing of manholes shall be subsidiary to the manhole and testing of gravity sewers shall be subsidiary to the sewer. Manhole and sanitary sewer testing shall be witnessed by the Engineer. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to complete testing of sanitary sewers and sanitary sewer manholes. After cleaning, the Contractor shall test sanitary sewers and manholes as follows:

i. <u>Manhole Testing</u>. All manholes shall be either vacuum or hydrostatically tested in the presence of the Engineer and in accordance with these procedures. Existing manholes or new manholes constructed over existing lines do not require testing. **If the seal on a new manhole is broken by an adjustment or**

other procedure, than a new vacuum test is required. Manholes greater than 72" diameter may be tested hydrostatically at the request or approval of the Engineer.

(1) <u>Vacuum Test.</u> Plug all manhole entrances and exits, other than the manhole top access, by using suitably sized and rated pneumatic or mechanical pipeline plugs. Follow the manufacturer's recommendations and warnings for proper and safe installation of such plugs, taking care to securely brace the plugs and the pipe. Attach the vacuum test device to the manhole top and draw a vacuum to 10 inches of Mercury. With the valve at the vacuum line connection closed and the vacuum pump off, measure the time required for the vacuum to drop to 9 inches of Mercury. The manhole passes the test if the time is greater than 60 seconds for a 48 inch diameter manhole, 75 seconds for a 60 inch diameter manhole, and 90 seconds for a 72 inch diameter manhole. If the manhole fails the test, the Contractor shall locate the leak and make proper repairs to the interior of the manhole with non-shrink grout. The manhole shall be retested and repaired or replaced until acceptable test results are obtained.

(2) <u>Hydrostatic Test.</u> Manholes may be tested using internal or external hydrostatic pressure. External hydrostatic testing shall only be used where the groundwater level is at least 4 feet above the invert of the manhole. In all other cases, the internal hydrostatic test procedures must be followed. Sewers connected to the manhole shall be adequately plugged.

For the internal hydrostatic test, the manhole shall be filled with water to the top of the ring or to a maximum depth of 25 feet above the invert. Water gain or loss shall not exceed 1.14 gallons per day per vertical foot of manhole for either external or internal hydrostatic testing. Infiltration and exfiltration shall be determined after 24 hours of hydrostatic testing by determining the gain or loss of water in the manhole. Contractor shall be responsible for retrieving any plugs or material accidentally washed down a sewer.

ii. <u>Deflection Testing</u>. All flexible and semi-rigid pipes used for sanitary sewer lines shall be tested for deflection. The Mandrel Deflection Test is conducted by pulling the test device through a completed sewer run, from manhole to manhole. If the Mandrel gets caught in the pipeline and cannot be pulled through the line (manhole to manhole) in one straight pass, the line fails. Pipe through which the mandrel does not pass will be considered unacceptable, and shall be re-laid, and also re-tested.

Deflection shall not exceed 5% of the **average inside** diameter of the pipe for pipes up to and including 12 inch. For pipes over 12 inches in diameter, the allowable deflection shall not exceed 4% **of the nominal inside diameter.** The mandrel test shall not be performed within 30 days of pipe installation.

The mandrel shall be made of steel or other hard metallic, non-corrodible, nonpliable material and have non-adjustable legs. The mandrel shall: (1) be a rigid nonadjustable, odd number of legs (9 legs minimum), mandrel having an effective length not less than its **inside** diameter; and (2) be fabricated of steel, fitted with pulling rings at each end, stamped or engraved on some segment other than a runner indicating the pipe material specification nominal size and be furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel.

The mandrel shall be pulled through the pipe by hand. The Engineer may require the mandrel to be certified by an independent testing laboratory to insure that it meets dimensional requirements.

Nominal Pipe Size (inches)	Minimum Mandrel Diameter (inches)
6"	5.7"
8"	7.3"
10"	9.2"
12"	10.9"
12"+	Nominal Inside Diameter x 96%

iii. <u>Gravity Sewer Line Testing.</u> In addition to the visual inspection, the Contractor shall furnish all labor, tools and equipment necessary to perform low pressure air tests on all pipe installed under the contract, including laterals and service stubs. The methods and equipment used to make the test shall be approved by the Engineer before any testing is started. The Contractor shall, at their own expense, correct any excess leakage and repair any damage to the pipe or its appurtenances indicated by, or resulting from, the test. For the purpose of testing, a section of the sewer shall be considered as the length of sewer between successive manholes. Any section that fails the test shall be repaired and retested by the Contractor until the leakage is within the allowable limit.

(1) Low Pressure Air Test. This test method provides procedures for testing sewer lines using low-pressure air to prove the integrity of the installed material and the construction procedures. Tests shall conform to the requirements of this section, ASTM F 1417 and C 828. The section of pipe between successive manholes shall be sealed with suitable plugs.

This low-pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over-pressurized or plugs are installed or restrained improperly. No one shall be allowed in the manholes during the actual testing. All plugs shall be braced during the testing. Do not over-pressurize the line. Do not exceed 9.0 psig. One of the plugs shall have an orifice through which to pass air into the section of pipe being tested. The air supply source (air compressor) shall have a 9 psig pressure relief valve. The air supply line shall have a positive on-off valve and suitable means for readily disconnecting it at the control panel. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge having a range of from 0 to 10 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of ± 0.04 psi.

The line under test shall be slowly pressurized to approximately 4 psi. Regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig for at least 2 minutes. The air temperature should stabilize in equilibrium with the temperature of the pipe walls. Disconnect the air supply and decrease the pressure to exactly 3.5 psi before starting the test. Determine the time required for the pressure to drop from 3.5 psi to 2.5 psi, and compare this interval to the required minimum holding time provided by the City of Topeka to determine if the rate of air loss is within the allowable.

If the pressure drops 1.0 psig before the appropriate time has elapsed, the air loss rate shall be considered excessive and the pipe section has failed the test. For testing of long sections or sections of larger diameter pipes, or both, a timed-pressure drop of 0.5 psig shall be used in lieu of a 1.0 psig drop. It is not necessary to hold the test for the entire period of time when it is evident that the rate of air loss is zero or less than the allowable if authorized by the Engineer. Upon completion of the test, open the bleeder valve and allow all air to escape. Plugs should not be removed until air pressure in the test section has been reduced to atmospheric pressure.

iv. <u>Television Inspection</u>. After the sewer line has passed the air test, the City shall inspect the line with television equipment. The Contractor at no additional cost to the City/County shall repair all defects found by this inspection.

v. <u>Force Main Testing</u>. After the force main has been installed, anchored or blocked as specified, the pipe shall be filled with water and subjected to pressure and leakage tests.

All piping shall be tested by water pressure at not less than twice the maximum operating pressure or at 100 psig, whichever is greater, for a sufficient period to examine the pipeline for leakage, cracks, defects or other faults. Any leaks shall be repaired and tests repeated until all defects have been repaired.

After approval of repairs, the pressure shall be set at twice the maximum operating pressure or at 100 psig, whichever is greater, and maintained for a period of 3 hours with the total loss of water being measured. The amount of water allowed to be lost during this time shall comply with AWWA C600 for DIP and AWWA Manual M23 for PVCP.

The test pressure shall be applied by a hand operated force pump, or other suitable device, with the pump taking suction from a reservoir of small enough volume so that the amount of water loss can be measured volumetrically.

The Contractor shall furnish all water necessary for filling the lines and for making the tests.

Any leaks which appear during the one-year warranty period shall be repaired at the expense of the Contractor.

D. Bid Items, Measurement and Payment.

(1) Bid Items:

(<u>*)</u> " SANITARY SEWER	Unit: Lineal Foot (nearest 1 L.F.)
(*)" SANITARY SEWER (DIP)	Unit: Lineal Foot (nearest 1 L.F.)
(*)" SANITARY SEWER (VCP)	Unit: Lineal Foot (nearest 1 L.F.)
(*)" SANITARY SEWER (PVCP)	Unit: Lineal Foot (nearest 1 L.F.)
SERVICE (WYE) CONNECTION, $(\underline{*})''$	Unit: Each
(*)" RISER PIPE (TYPE)	Unit: Lineal Foot (nearest 1 L.F.)
(*)" HOUSE SERVICE LINE (TYPE)	Unit: Lineal Foot (nearest 1 L.F.)
(*) D '	

(*) - Diameter of pipe (TYPE) – DIP, VCP, or PVCP

(2) <u>Measurement.</u> "(*)" Sanitary Sewer", "(*)" Sanitary Sewer (DIP)", "(*)" Sanitary Sewer (VCP)", and "(*)" Sanitary Sewer (PVCP)" for the various sizes of sanitary sewer pipes shall be measured as the horizontal distance from centerline of manhole to centerline of manhole measured to the nearest foot.

"Service (Wye) Connection, (*)"" shall be measured per Each service (wye) of the various sizes installed.

"(*)" Riser Pipe (Type)" shall be measured as the length along the centerline of the riser, measured to the nearest foot for the various sizes and types of riser pipe installed.

"(*)" House Service Line" shall be measured as the horizontal distance, to the nearest foot, from the centerline of the main sewer to the end of the house service line for the various sizes and types of service line pipe installed.

(3) <u>Payment.</u> The completed and accepted lengths of Sanitary Sewers, measured as specified above, shall be paid for at the Contract unit price per foot for each of the various sizes and types of Sanitary Sewers, which payment shall be full compensation for all excavation, shoring, bedding, pipe, joints, fittings, laying, materials, backfilling,

cleaning and testing as specified; and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

The completed and accepted "Service (Wye) Connection, (*) inch", measured as provided above, shall be paid for made at the Contract unit price per Each for each of the various sizes of Service Wyes, which payment shall be full compensation for all equipment, tools, labor, and incidentals necessary to complete the work as specified.

The completed and accepted "(*) inch Riser Pipe (Type)", measured as provided above, shall be paid for made at the Contract unit price per foot for each of the various sizes and types of Riser Pipes, which payment shall be full compensation for all equipment, tools, labor, and incidentals necessary to complete the work as specified.

The completed and accepted "(*) inch House Service Line (Type)", measured as provided above, shall be paid for made at the Contract unit price per foot for each of the various sizes and types of House Service Lines, which payment shall be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work as specified. If Rock Excavation as defined in Subsection 3.06 is required to install "House Service Line", that rock excavation shall be measured and paid for as defined in Subsection 3.06.

6.06 <u>Encasements, Cradles, and Arches.</u> The Contractor shall construct concrete encasements, cradles and arches at the locations, to the dimensions, and to the requirements shown in the Project Documents or as determined by the Engineer. Concrete shall be Commercial Grade meeting the requirements set forth in Subsection 5.01.

A. Bid Items, Measurement and Payment.

(1) <u>Bid Items.</u>

CONCRETE ENCASEMENT FOR (*)" PIPE	Unit: Lineal Foot (nearest 1 L.F.)
CONCRETE CRADLE FOR (*)" PIPE	Unit: Lineal Foot (nearest 1 L.F.)
CONCRETE ARCH FOR (*)" PIPE	Unit: Lineal Foot (nearest 1 L.F.)

(2) <u>Measurement.</u> Concrete Encasements, Cradles, and Arches for the various sizes of storm or sanitary sewer pipes shall be measured as the length, to the nearest foot, of the cradle, arch or encasement along the centerline of the pipe.

(3) <u>Payment.</u> Completed and accepted Concrete Encasements, Cradles, and Arches for the various sizes of storm or sanitary sewer pipes shall be paid for at their respective Contract unit prices, which payment shall be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work as specified.

6.07 MANHOLES AND INLETS

A. Materials

(1) <u>Precast Reinforced Concrete Manholes, Risers and Tops.</u> Materials for circular vertical precast reinforced concrete manholes, risers and tops shall conform to the applicable requirements of ASTM C478. The minimum shell thickness shall be as follows.

<u>Depth</u>	Minimum Shell Thickness
0 to 16 feet	One twelfth internal shell diameter
16 feet or greater	One twelfth internal shell diameter plus one inch

(2) <u>Precast Reinforced Concrete Structures, Risers and Tops.</u> Materials for precast reinforced concrete structures, risers and tops excluding concrete pipe, box culverts and circular precast reinforced concrete manholes, shall conform to the requirements of ASTM C913. This shall include distribution boxes, catch basins, inlets (including Type I-P and II-P) and similar structures.

(3) <u>Concrete</u>. Cast-in- place manholes and inlets, and the cast-in-place or pre-cast concrete bases of pre-cast manholes and inlets, shall be constructed of Structure Class Concrete as specified in Subsections 5.01 and 5.04.

(4) <u>Reinforcing Steel.</u> Shall meet the requirements of the Project Documents and specified in Subsection 5.03.

(5) <u>Structural Steel.</u> Carbon structural steel shapes, plates, and bars used in manholes and inlets shall conform to the requirements of ASTM A36.

(6) <u>Joint Sealants for Precast Manholes and Inlets.</u> Preformed mastic used shall conform to the requirements of AASHTO M 198 and must be pre-approved by the Engineer.

(7) <u>Non-shrink Grout.</u> Grout shall be Five Star by U.S. Grout Corporation or an approved equal. Grout shall not be a gas liberating type, but shall be non-metallic and non-corrosive.

(8) <u>Resilient Connectors.</u> A flexible pipe to manhole connector shall be used whenever a sanitary sewer pipe penetrates into a concrete manhole or structure and shall be of the two types specified in Paragraphs a and b below:

i. <u>Type Cast Into Manhole Wall At The Manufacturing Facility.</u> The connector shall be the A•LOK X-CEL as manufactured by A•LOK PRODUCTS, INC., Tullytown, PA or approved equal. The connector shall be molded from materials with physical/chemical properties that meet or exceed the physical/chemical resistant properties and performance requirements outlined in ASTM C923.

The Z•LOK pipe to manhole connector as manufactured by A•LOK PRODUCTS, INC., Tullytown, PA or an equal product may be used with approval of the Engineer.

ii. <u>Pipe To Manhole Connector For Penetrations Into Existing Concrete</u> <u>Manholes And Structures.</u> The connector shall be the G3 Boot System featuring component packaging as manufactured by A•LOK PRODUCTS, INC., Tullytown, PA or approved equal.

The connector shall be made from materials that conforms to the physical and chemical requirements outlined in Section 4, "Materials and Manufacture" of ASTM C923 "Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals", and the overall design will meet or exceed Section 7, "Test Methods and Requirements" of ASTM C923.

(9) Iron Castings.

i. <u>Governing Standard</u>. Except as modified or supplemented herein, all castings furnished shall conform to the requirements of ASTM A48, Class 35B or higher.

ii. <u>Acceptable Products.</u> Castings shall be the product of Clay & Bailey, Deeter, Neenah, or an approved equal.

iii. Submittals.

(1) <u>Cast Test Bars.</u> Cast test bars shall be delivered to the site with the castings. Laboratory verification of chemistry, Brinell Hardness, or tensile strength will be required at the Engineer's request and shall be delivered within two weeks of request at no additional cost.

(2) <u>Certificate of Insurance.</u> The casting manufacturer shall purchase and maintain product liability insurance in the amount of \$3,000,000.00. Prior to delivery of castings, the Contractor shall deliver to the Engineer the manufacturer's properly completed certificate of insurance.

iv. <u>Marking.</u> All castings shall have the manufacturer's name and Julian heat date legibly cast thereon. Indistinct markings shall be grounds for rejection of individual castings. All castings of foreign origin must comply with current U.S. Customs marking regulations.

(1) <u>Sanitary Sewers.</u> The designation "CITY OF TOPEKA SANITARY SEWER" shall be cast in 2-1/2 inch high block letters flush with the traffic surface on all manhole covers intended for wastewater use. Letters shall be arranged around the circumference of the cover. A surface pick slot and concealed pick slots shall be manufactured into the lid.

(2) <u>Storm Sewers and Inlets.</u> The designation "DRAINS TO RIVER DO NOT DUMP" shall be cast in 2-1/2 inch high block letters arranged around the circumference of all manhole and inlet covers intended for

stormwater use. A likeness of a catfish shall be cast in the center of the lid. A standard open pick slot shall be manufactured into the lid.

v. <u>Dimensions and Weight.</u> All castings shall conform to the dimensions and weights indicated in the Project Documents. Dimensions shall not deviate more than 1/16 inch per foot. Surfaces of lids or covers shall not vary more than 1/16 inch above or below surfaces of accompanying frames or rings when properly seated. The weight of individual castings shall not vary by more than 4 percent from that specified.

vi. <u>Minimum Tensile Strength.</u> The tensile strength of each casting provided under this specification shall be at least 30,000 psi.

vii. <u>Workmanship</u>. All castings shall be manufactured true to pattern. Compatibility and fit of component parts shall be subject to inspection and acceptance or rejection. Castings shall be free of defects, to include but not necessarily limited to, blow holes, sand inclusions, cracks, distortion, and/or deviations from specified or indicated dimensions. All castings shall be furnished in bare metal.

viii. <u>Compliance with U.S. Customs Regulations.</u> All castings imported into the United States shall conform to the applicable provisions of United States Customs regulations.

ix. <u>Interchangeability.</u> Manhole frames and covers shall be manufactured so as to be fully interchangeable. All of the covers provided shall be suitable for installation on any of the frames provided and shall not rock or tip under an applied load.

x. <u>Inside Drops for Manholes.</u> Fasteners for inside drops shall be 3/8" stainless steel fasteners. Straps shall be 1-1/2" wide, 11gauge (.1196") stainless steel. Pinch bolt and nuts shall be 3/8" diameter, Type 18-8 stainless steel. The inside drop system by Reliner/Duran Inc. has been approved for use in drop manholes. Other systems may be used as approved by the Engineer. The Contractor shall submit catalog cuts to the Engineer to obtain approval of systems used as inside drops in manholes or inlets.

B. Construction Requirements

(1) <u>Excavation and Subgrade Preparation</u>. The Contractor shall provide excavation and subgrade for manholes and inlets as specified for structures in Section 2. The Contractor shall obtain the Engineers approval of the excavation and subgrade prior to constructing manholes or inlets.

(2) Precast Reinforced Concrete Manholes and Inlets.

i. <u>General.</u> Pre-cast manholes and inlets shall be constructed in accordance with the Project Documents. The Contractor shall handle the pre-cast sections with care to avoid damage to joint ends of each section. Damaged sections may be subject to rejection at the discretion of the Engineer. All manhole and inlet

construction shall be watertight. The invert and walls shall be cleaned of excess grout and laitance.

Inlets or storm drainage systems other than those conforming to the Standard Details may be used only with the approval of the Engineer and in conformance with complete details included in the Project Documents.

ii. <u>Concentric and Eccentric Manholes.</u> Precast Reinforced Concrete Manholes shall be constructed in sections. Precast reducer cone sections for 4'-0" diameter manholes shall be of the concentric type. Manholes of 5'-0" and larger diameter may have cones or concrete flattop lids of the eccentric type. Where eccentric types are used in pavements, the top section shall be rotated so that the lid is not in a wheel path or curb line.

iii. <u>Joints.</u> All joints shall be set and sealed with an approved preformed mastic sealant. Two rings of preformed mastic sealant must be used for joint between the manhole concrete and the cast iron ring.

iv. <u>Base & Invert.</u> Cast-in-place or pre-cast concrete bases for pre-cast inlets and shall be constructed as detailed in the Project Documents. Invert channels shall be smooth and shall conform to adjacent sewer sections as detailed in the Project documents.

v. <u>Lifting Holes.</u> Lifting holes shall be filled and sealed with non-shrink grout or concrete.

(3) <u>Cast-in-Place Concrete Manholes, Inlets, and Special Structures.</u> Forms, mixing and placing of concrete, placing of reinforcing, finishing and curing shall conform to the requirements for Structure Class Concrete as specified in Section 5. Invert channels shall be smooth and shall conform to adjacent sewer sections as detailed in the Project documents.

(4) <u>Sewer Pipe Connections.</u> All sanitary sewer pipe connections to manholes shall be flexible, unless approved by the Engineer. Storm sewer pipe connections to inlets or manholes may be either rigid or flexible. All connections shall be made carefully to prevent leakage and breakage of the pipe.

i) <u>Rigid connections</u> shall be made using concrete or grout to fill the annular space around the pipe in manhole walls. A clamp-on resilient connector shall be installed on the pipe prior to being grouted into wall. Pipes shall be encased with concrete as shown on the Standard Detail Drawing. Concrete used in concrete collars shall cure for a minimum of 48 hours unless otherwise directed by the Engineer.

ii) <u>Flexible connections</u> shall allow for limited differential settlement to occur between the pipe and manhole. The uniform compaction of the bedding material under the pipe and up to the springline of the pipe is essential to the control of this differential settlement. Cast-in-place resilient connectors shall be used with all flexible connections. To ensure a flexible watertight connection, no mortar shall be placed around the connector on the outside of the structure or around the top half of the connector on the inside when completing the invert work.

(5) <u>Inside Drops</u> for manholes shall be constructed as detailed on the Standard Manhole Details Drawing. Stainless steel straps shall be secured to the structure wall with 3/8" stainless steel fasteners at 4 ft. intervals (minimum of 2).

(6) <u>Backfill and Compaction</u>. The Contractor shall backfill and compact backfill for manholes and inlets as specified for structures in Section 2.09 and 2.10. The Contractor shall obtain the Engineers approval prior to backfilling around manholes or inlets.

(7) <u>Cast Iron.</u> Castings shall be installed at the locations and to the requirements shown in the Project Documents. Castings shall be true to line and grade and match the structures to which they are attached. Castings shall be installed in the structures in accordance with the manufacturer's instructions and requirements

Manhole Castings shall be sealed with two rings of preformed mastic sealant. In situations where the exterior walls of the manhole will be exposed to weather, the manhole casting shall be bolted to the precast cone section or flat slab top using 5/8 inch diameter galvanized bolts and threaded inserts in the concrete.

(8) <u>Leveling and Adjusting Manhole Rings, Frames and Covers.</u> When either new manholes or existing manholes are in areas to be paved or re-graded, manhole frames shall be set such that it will be flush with, and at the same slope of as, the new pavement. For new manholes, all leveling or adjustment to pavement slopes shall be accomplished with a concrete leveling course at the top of the top slab on Type II manholes and at the top of the cone on Type I manholes. Where the ring of an existing manhole is being adjusted, the concrete leveling course may be constructed immediately below the frame. Bitumastic shall not be used for leveling or adjusting the slope of manhole rings.

Manholes and valve castings located in a traffic lane shall be adjusted to meet the grade and slope of the adjacent pavement within a tolerance limit of $1/8\pm$ inch. The tolerance shall be measured as the vertical distance between a 10 foot straight edge, centered over the manhole or valve casting in both the longitudinal and transverse directions, and the top of the manhole or valve casting.

(9) <u>Manhole Testing</u>. Requirements for the testing of sanitary sewer manholes are specified in Subsection 6.04 C. Requirements for the testing of storm sewer manholes are specified in Subsection 6.03 C.

C. Bid Items, Measurement, and Payment.

(1) <u>Bid Items:</u>

(*)	FT. DIA. STANDARD MANHOLE, TYPE (**) (0'-6')	Unit: Each
<u>(*)</u>	FT. DIA. ADDITIONAL DEPTH FOR STD. MANHOLE, TYPE (**)	Unit: Vertical Foot (nearest 0.1 V.F.)

INSIDE DROP FOR MANHOLE

Unit: Each

SPECIAL STRUCTURE	Unit: Each
ADJUST EXISTING (MANHOLE OR VALVE) COVER	Unit: Each
DITCH INLET, TYPE (***)	Unit: Each
CURB INLET, TYPE <u>(#)</u> , L= <u>(##)</u> FT.	Unit: Each
ADDITIONAL DEPTH, CURB INLET TYPE <u>(#)</u> , L= <u>(##)</u> FT	Unit: Vertical Foot (nearest 0.1 V.F.)
CURB INLET, TYPE II-P	Unit: Each
ADDITIONAL DEPTH, CURB INLET TYPE II-P	Unit: Vertical Foot (nearest 0.1 V.F.)
CURB INLET- MANHOLE, TYPE II-P	Unit: Each
ADDITIONAL DEPTH, CURB INLET-MANHOLE, TYPE II-P	Unit: Vertical Foot (nearest 0.1 V.F.)
AREA INLET, TYPE II-P (<u>(###)</u> GRATE)	Unit: Each
ADDITIONAL DEPTH, AREA INLET TYPE II-P	Unit: Vertical Foot (nearest 0.1 V.F.)
AREA INLET- MANHOLE, TYPE II-P (<u>(###)</u> GRATE)	Unit: Each
ADDITIONAL DEPTH, AREA INLET-MANHOLE, TYPE II-P	Unit: Vertical Foot (nearest 0.1 Ft.)

- (*) -- Diameter of the Manhole in feet
- (**) -- Type I, Type II, or other Type as designated in the Project Documents
- (***) Type I, Type III, or other Type as designated in the Project Documents
- (#) Type I-P or other Type as designated in the Project Documents.
- (##) Outside length of inlet parallel to curb as designated in the Project Documents
- (###) Pedestrian, Traffic, Yard, or other type of grate as designated in the Project documents.
- (2) Measurement.

i. <u>Manholes and Inlets.</u> Manholes and inlets shall be measured per Each of the various sizes and types of inlets and manholes installed.

ii. <u>Additional Depth.</u> If a manhole or inlet (not including ditch inlets) has a depth dimension greater than 6.0 feet, it shall be measured per Each as stated above and the portion of the structure's "Additional Depth" or depth in excess of 6.0 feet measured to the nearest 0.1 Vertical Foot.

"Depth" for the various types of structures is defined as follows:

- Manholes Top of cover frame to invert of lowest pipe
- Curb Inlets Top of Curb to invert of lowest pipe

• Area inlets – Outside edge of the top of the grate to the invert of the lowest pipe.

Ditch Inlets shall be measured only per Each installed. "Additional Depth" is not measured for Ditch Inlets.

iii. <u>Special Structures and Inside Drops for Manholes.</u> "Special Structure" and "Inside Drop for Manhole" shall be measured per Each of the items installed.

iv. <u>Adjust Existing (Manhole or Valve) Cover.</u> Each existing manhole or valve frame and cover that is adjusted to grade and/or slope shall be measured per Each adjusted.

(3) <u>Payment.</u> Completed and accepted inlets and manholes, inside drops, special structures, and the regrading of existing manhole covers, measured as provided for above, shall be paid for at the Contract unit per Each for the various sizes and types of items listed, which payment shall be full compensation for all excavation, backfill, shoring, sheeting, dewatering, concrete, masonry, castings, reinforcement, steps, mortar, grout, castings, connectors, and cleaning as specified; and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

The completed and accepted "Additional Depth" for inlets an manholes, measured as provided above, shall be paid for made at the Contract unit price per vertical foot of depth greater than 6.0 feet for each of the various sizes and types of inlets and manholes (except ditch inlets), which payment shall be full compensation for all excavation, shoring, installation, forming, reinforcing, castings, connectors, backfilling and cleaning as specified; and all materials equipment, tools, labor, and incidentals necessary to complete the work.

6.08 CONNECTION TO EXISTING STRUCTURES

A. <u>Materials</u>. Materials for the connection of pipes to existing structures shall meet the requirements specified in Subsection 6.05 B.

B. <u>Construction Requirements.</u> Connection to Existing Structures shall be done in such a manner as to prevent damage to existing structures. An opening for installation of pipe shall be cut to a diameter approximately 4 inches larger than the outside diameter of the pipe to be installed. New invert channels shall be constructed as needed to conform to the standard details.

(1) <u>Rigid Connections.</u> A clamp-on resilient connector shall be installed on pipe prior to being grouted into wall. Annular space around the pipe shall be filled solid with grout.

(2) <u>Flexible Connections.</u> A flexible pipe to manhole connector shall be used for sanitary pipe penetrations into existing concrete manholes and structures. The seal between the connector and the manhole wall shall be made by placing the connector and expansion ring into the center third of the concrete opening. The band is then expanded and locked by utilization of torque wrench or porta-power unit to transmit the force required to seal the rubber connector against the concrete.

The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.

- C. Bid Item, Measurement and Payment.
 - (1) <u>Bid Item:</u>

CONNECTION TO EXISTING STRUCTURE

Unit: Each

(2) <u>Measurement.</u> Will be for each connection to an existing structure

(3) <u>Payment.</u> Completed and accepted "Connect to Existing Structure" shall be paid for at the Contract unit price per Each connection of a sewer pipe to an existing structure, which price shall include all excavation, cutting, connecting, rebuilding of invert, grouting, backfilling, and compacting as specified; and all materials equipment, tools, labor, and incidentals necessary to complete the work.

END OF SECTION

SECTION 7

ASPHALTIC CONCRETE SURFACING

7.01 SCOPE

This section covers the construction of hot mix, hot laid asphaltic concrete pavement, asphalt pavement patching, cold milling, and related work.

A. <u>Traffic Control.</u> The Contractor shall provide work zone traffic control as specified in Section 4.24 for asphaltic concrete paving, asphalt patching, and cold milling operations unless it is stated otherwise in the Project Documents. Work zone traffic control shall be subsidiary to the paving, patching, or milling work unless pay items for work zone traffic control are included in the Project Documents.

7.02 ASPHALTIC CONCRETE PAVEMENT

A. <u>General Description</u>. Asphaltic concrete pavement shall consist of placing a leveling, base, intermediate, or surface course of hot-mixed, hot-laid asphaltic concrete on a prepared subgrade, base, or existing pavement in accordance with these Standard Technical Specifications and in conformity with the lines, grades, widths, thicknesses and typical sections shown in the Project Documents.

B. <u>Materials</u>. Materials shall conform to the requirements specified in Division 1200, Asphalt Materials, of the KDOT Standard Specifications except as amended herein.

(1) <u>Asphalt Binder</u>. Asphalt binder shall conform to the requirements of Performance Graded Asphalt Binder as specified in Subsection 1202.2 of the KDOT Standard Specifications. Unless otherwise specified or approved by the Engineer, PG 70-28 Performance Grade Asphalt Binder shall be used for the binder in BM-2A asphaltic concrete surface courses and PG 64-22 Performance Grade Asphalt binder shall be used in all other courses. Asphaltic concrete shall be comprised of all new materials or a blend of new materials in combination with a maximum of 10 percent reclaimed asphalt pavement unless specified otherwise in the Project Documents.

Only performance graded polymer modified asphalt binders that are supplied by producers included on KDOT's "Prequalified List" shall be used.

i. <u>Basis of Acceptance.</u> Asphalt Binder shall be accepted based upon the Engineer's receipt and approval of a certification prepared by the producer indicating the quality and quantity of material in each shipping container meets the requirements specified. Certifications must be based upon the producer's quality control testing as required for KDOT prequalification.

(2) <u>Asphalt for Tack Coats.</u> Cutback asphalt and emulsified asphalt for tack coats shall conform to the requirements of the KDOT Standard Specifications Section 1203 for Emulsified Asphalt and Section 1204 for Cutback Asphalt. Grades may vary for surface and temperature conditions.

i. <u>Basis of Acceptance.</u> Asphalt for tack coat material shall be accepted based upon the Engineer's receipt and approval of a certification prepared by the producer indicating the quality and quantity of material in each shipping container meets the requirements specified. Certifications must be based upon the producer's quality control testing as required for KDOT prequalification.

(3) <u>Aggregate.</u> Aggregates for asphaltic concrete shall conform to the requirements specified in Section 1103, Aggregates for Hot Mix Asphalt (HMA) of the KDOT Standard Specifications, except as amended herein.

The mix may be composed of any combination of aggregates and mineral filler supplements meeting the applicable requirements in Table 1103-1 and 1103-2 of Section 1103, Aggregates for Hot Mix Asphalt, of the latest edition of the "Standard Specifications for State Road and Bridge Construction", Kansas Department of Transportation. Not more than 30% of the material passing the No. 200 sieve shall be present in the uncrushed aggregate. Surface course shall contain natural sand from an alluvial deposit of such grading that the portion of the sand passing the No. 8 sieve and retained on the No. 200 sieve will be not less than 15% of the total mix.

i. <u>Gradation</u>. The gradation for the combined aggregates in the bituminous mixture shall be as follows:

Sieve Size	% Retained	Job Mix Tolerance
³ ⁄ ₄ inch	0	
3/8 inch	6-21	± 5
No. 4	23-40	± 5
No. 8	38-56	± 5
No. 30	61-82	± 4
No. 100	88-99	± 3
No. 200	92-99	+ 2

ii. Quality of Individual Aggregates.

Soundness, minimum0.90Wear, maximum40%Absorption, maximum4.0%The Plasticity Index shall not exceed 6.The maximum moisture shall not exceed 0.5%.

iii. <u>Deleterious Substances.</u> The combined aggregates shall be free from alkali, acids, organic matter, or injurious quantities of other foreign substances. Other deleterious substances shall not exceed the following percentages by weight:

Sticks	0.1%
Shale, shale-like or soft or friable particles	
singly or in combinations	1.0%
Coal	0.5%

Aggregates shall be tested for deleterious substances by the aggregate producer by the test methods identified in Section 1115 - "Test Methods for Division 1100, Aggregates" of the KDOT Standard Specifications.

iv. <u>Basis of Acceptance</u>. Aggregates for asphaltic concrete shall be accepted based upon the Engineer's receipt of a certification from the aggregate producer that the material meets the requirements specified.

C. <u>Mix Designation</u>. The asphaltic concrete shall conform to the mix designation BM-2A as defined and specified in the KDOT Standard Specifications for State Road and Bridge Construction, 1990 Edition. The asphaltic concrete shall be comprised of all new materials or a blend of new materials with a maximum of 10 percent reclaimed asphalt pavement (RAP) unless otherwise specified in the Project Documents.

D. <u>Asphaltic Concrete Mix Design</u>. The Marshall method of mix design shall be used to test specimens of asphaltic concrete. Specimens shall be compacted at a temperature of 200° F to 300° F. A minimum of five sets of Marshall Stability properties shall be plotted on standard graph paper. The range of asphalt binder content shall be wide enough so that the Marshall Stability Curve peaks. Determination of the design mix binder content shall be made from these graphs. The mix design shall meet the following criteria:

	Street or Road Functional Classification							
Mix Design Criteria	Principal/Minor Arterial	Local						
	and Major/Minor Collector							
Compaction – Blows per side of	75	50						
specimen	13							
Marshall Stability (minimum)	1800	1200						
Flow (1/100 inches)	8-16	8-18						
% Binder (deviation from target	. / 0.6%	1/ 0 69/						
binder content)	+/- 0.0%	+/- 0.0%						
% Voids – Total Mix ^{Note 1}	3-5	3 – 5						
% Voids in Mineral Aggregate	13% Base Course	13% Base Course						
(minimum)	14% Surface Course	14% Surface Course						

TABLE 7.02 D. - ASPHALTIC CONCRETE MIX DESIGN

Note 1 The target air voids for determining asphalt content shall be 4%. See Subsection 7.02 I. (4).

No asphaltic concrete shall be produced for payment until an asphaltic concrete mix design, including a design job-mix gradation, has been approved by the Engineer. The preparation of the asphaltic concrete mix design shall be performed by an approved testing laboratory and technicians certified in Asphalt Marshall Design (AMD). The preparation of the mix design shall be subsidiary to the bid item "Asphaltic Concrete".

E. <u>Equipment</u>. Equipment shall conform to the requirements specified herein. No diesel fuel shall be allowed on an asphaltic concrete lift.

(1) <u>Hot Mix Asphalt Plant.</u> The hot mix asphalt plant shall conform to the requirements specified in Subsections 155.6 (a) and 155.6 (c) of the KDOT Standard Specifications.

(2) <u>Storage or Surge Bins.</u> Storage or surge bins for asphaltic concrete shall be used only with written approval of the Engineer. If, after approving the use of storage or

surge bins, the Engineer determines that segregation is occurring with their use, the Engineer may prohibit their continued use. Storage or surge bins shall conform to requirements specified in Subsection 155.3 of the KDOT Standard Specifications.

(3) <u>Weighing Equipment</u>. The weighing equipment for truck-hauled material shall consist of 1) an accurate and reliable platform scale or 2) an electronic system in which the scale is equipped with an automatic printout system that will print the weights of the material being delivered.

The scale shall be accurate to 0.5% throughout the range of use. The scale shall be checked, adjusted and certified by a qualified manufacturer's representative or an approved testing firm at 1) a maximum of 6 months intervals, 2) when the scale is repaired, and 3) any other time deemed necessary by the Engineer to assure the scale's accuracy. Platform scales shall have a platform of adequate length to weigh the longest truck in use on the project in one operation.

(4) <u>Hauling Equipment.</u> Any truck used for hauling asphaltic concrete shall have a tight, clean, smooth metal bed which has been thinly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the asphaltic concrete from adhering to the bed. The coating material shall not contaminate or alter the characteristics of the asphaltic concrete being hauled. The use of petroleum derivatives for coating the truck beds is prohibited. Trucks shall be equipped with a canvas cover or other suitable material of such size as to protect the mixture from the weather.

(5) <u>Asphalt Distributor</u>. The distributor shall conform to the requirements specified in Subsection 155.2 of the KDOT Standard Specifications. The distributor shall be calibrated and checked before being used. The Contractor shall provide to the Engineer a certificate indicating that the distributor meets the specified requirements and has been calibrated.

(6) <u>Paver.</u> The paver shall conform to the requirements specified in Subsection 155.4 of the KDOT Standard Specifications.

(7) <u>Thermometers and Heat Sensing Guns.</u> The Contractor shall provide to the Engineer certificate indicating that thermometers and heat sensing guns have been calibrated at the frequency and manner recommended by the manufacturer.

(8) <u>Compaction Equipment.</u> Self-propelled steel rollers shall conform to the requirements specified in Subsection 151.4 (c) of the KDOT Standard Specifications. Heavy self-propelled pneumatic-tired rollers shall conform to the requirements specified in Subsection 151.3 (c) of the KDOT Standard Specifications.

F. <u>Construction Requirements</u>. Any base course shall be compacted, tested, and approved before the placement of an intermediate or surface course. Unless otherwise specified, any and all leveling, base and intermediate courses shall be the same mix designation as the surface course.

(1) <u>Preparation of the Asphalt Binder</u>. The asphalt binder shall be heated to a temperature within the range recommended by the liquid supplier and in manner that avoids local overheating.

(2) <u>Preparation of the Aggregate</u>. Except for the minor fluctuations, the aggregate for the asphaltic concrete shall be dried and heated at the time of mixing to be within a temperature range of 260° F. to 335° F. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid soot on the aggregate.

(3) <u>Preparation of the Asphaltic Concrete.</u> Dried aggregate shall be combined in the plant in accordance with the approved design job-mix gradation and asphaltic concrete mix design. The combined aggregate shall be thoroughly dry mixed prior to adding the bind. The binder shall be introduced into the mixture in proportion to the approved asphaltic concrete mix design. The wet mixing time shall not be less than 40 seconds, but in all cases shall be sufficient to produce a homogeneous mixture in which all the aggregate is uniformly coated. At the time of discharge from the plant, the asphaltic concrete shall be within the temperature range recommended by the binder supplier.

Sampling and testing of the asphaltic concrete to determine conformance with the asphaltic concrete mix design and the design job-mix gradation shall be made at intervals corresponding to the production of approximately 500 tons of asphaltic concrete, but not less than one set of tests shall be made each day asphaltic concrete is produced. This sampling and testing shall be performed by an approved testing laboratory and shall be subsidiary to the bid item "Asphaltic Concrete". The Contractor or the testing laboratory shall submit written test results to the Engineer's Project Representative as soon as the testing is complete.

(4) <u>Grade Control.</u> The Project Surveyor will make the survey required for the reference grade and will establish the center line points. The Contractor shall maintain the location of the points until the completion of the surface course or as directed by the Engineer.

The Contractor shall erect and maintain a reference string line and operate the paver to conform to the string line for the initial lift and any other lifts if specified by the Engineer. The string line shall be erected parallel with the reference grade, and the asphaltic concrete shall be spread at a constant elevation above, below or at the string line elevation as directed.

If automatic profile road building type equipment is used to prepare the subgrade, the requirements for an erected reference string line may be waived by the Engineer. The Contractor shall furnish and maintain an approved mobile string line for all lifts not laid with the erected string line, and operate the paver to conform to that string line. The longitudinal and transverse controls of the paver shall operate independent of each other to the extent necessary for the surface of the asphaltic concrete to conform to the string line and be uniform in cross section or crown.

(5) <u>Preparation of the Subgrade or Base.</u> The requirements for the preparation of earth or treated subgrade are specified in Subsections 3.10 and 3.11. No asphaltic concrete shall be placed on frozen subgrade.

i. <u>Cleaning Surface</u>. Concrete or asphalt pavement bases shall be cleaned of all dirt and other foreign material. Power brooms will not be acceptable for cleanup work without adequate dust control procedures. Clean and fill cracks and joints.

ii. <u>Tack Coat.</u> After the surface has been cleaned, a tack coat shall be applied at a rate of from 0.05 to 0.10 gallon per square yard to ensure a bond between pavement surfaces. Tack coat should be applied to uniformly cover the entire surface, including all vertical surfaces of joints, curbs, gutters, manholes and inlets, and brick or concrete base. Areas that cannot be coated from a distributor truck shall be coated by use of a spray wand.

The tack coat shall be applied to the top of base, intermediate and leveling courses the same day the subsequent lifts are to be hid. Tack coat is required for all subsequent lifts regardless of whether or not the lower lift was paved the same day. The tack coat shall be applied only to the area on which the asphaltic concrete is to be placed that same day. The Contractor shall re-apply tack coat to areas not paved the same day the tack was applied at no additional expense to the Owner.

Traffic, both construction and local, should be kept off fresh tack. A freshly applied tack coat surface may be slick, particularly before the asphalt emulsion has broken. To limit disruption of traffic and to keep traffic off the fresh tack, the Contractor shall reduce the length ahead of the asphalt laydown operation that the tack is applied. Workers shall be provided by the Contractor to prevent traffic from traveling over the tack coat.

If exposure of the tacked surface to traffic is unavoidable, the Contractor shall sand the surface at the rate of 6 lbs. per square yard. The Contractor shall broom the sand from the surface before the new pavement is placed to ensure a proper bond and then reapply the tack coat. The Contractor shall also clean and reapply tack to areas where traffic has tracked dirt onto the tacked surface or where traffic has pulled tack off of the surface.

(6) <u>Protection of Concrete Contact Surfaces</u>. Asphaltic concrete shall not be laid against concrete contact surfaces such as curb and gutter, inlets, etc. until the concrete is at least 5 days old and has reached 75% of its design strength.

(7) <u>Contact Surfaces.</u> Contact surfaces of curb and gutters, manholes, valve boxes, monuments boxes, and other similar structures shall be sprayed or painted with a thin, uniform tack coat.

(8) <u>Lift Thickness.</u> The nominal thickness of the compacted mat shall not exceed 2 inches for surface courses and 4 inches for other courses, unless specified otherwise in the Project Documents or requested by the Engineer. The Engineer may adjust the lift thickness when such adjustment is more adaptable to the total pavement thickness and when, in the opinion of the Engineer, it is not detrimental to placement and rolling conditions. The Engineer may also adjust the lift thickness to utilize the most efficient method of acquiring the required density and surface characteristics.

(9) <u>Laydown Temperature Requirements.</u> All asphaltic concrete shall be delivered to the paver at a temperature between 260° F and 335° F. Laydown operations shall be discontinued if, in the opinion of the Engineer, wind velocities create excessive cooling of the asphaltic concrete or moisture conditions cause excessive steam.

Base or Subgrade		Lift Th	ickness			
Temperature (°F)	1/2"**	³ /4"**	1"	1 1/2"	2"	3+"
32-40				305	295	280
40-50			310	300	285	275
50-60		310	300	295	280	270
60-70	310	300	290	285	275	265
70-80	300	290	285	280	270	265
80-90	290	280	275	270	265	260
90+	275	270	265	260	260	260
Recommended Minimum						
Rolling Time (minutes)	4	6	8	12	15	15

TABLE 7.02 F. (9): RECOMMENDED MINIMUM LAYDOWN TEMPERATURE (⁰F) FOR BASE COURSES *

*Surface course must be installed with ambient air temperature 50^{0} F and rising.

**Thicknesses less than 1 inch may be used only with written approval of the Engineer.

(10) <u>Paving Operations.</u> The asphaltic concrete shall be placed reasonably true to crown and grade by an automatically controlled paver. Asphaltic concrete may be placed by hand methods only where machine methods are impractical. The paver shall spread the asphaltic concrete without tearing, shoving or gouging the surface and shall strike a finish that is smooth, true to cross section, free of segregation, uniform in density and texture, seamless at center joints, true and straight at the edge lines, and free from hollows, transverse corrugations and other irregularities. If the pavement does not conform to all of these requirements, the plant production and paving operations shall be suspended until the deficiency is corrected.

All asphaltic concrete shall be delivered to the paver in time to permit the completion of the placement and compaction of the asphaltic concrete during daylight hours. Nighttime work on projects not open to traffic may be permitted only with written approval of the Engineer. The Contractor shall supply ample, appropriate lighting.

Tickets certifying asphalt mix and binder shall accompany each load of asphaltic concrete delivered to the project and shall be given to the Engineer's Representative.

(11) <u>Compaction</u>. The asphaltic concrete shall be uniformly compacted immediately following placement without tearing, shoving or gouging the surface. Delays in compacting freshly placed asphaltic concrete shall not be permitted.

Compaction of the mixture shall be accomplished using a steel-wheel roller or a **pneumatic tire roller**. Breakdown rolling shall be as close behind the paver as possible. The breakdown roller shall be a steel-wheel **roller** and operating in the vibratory mode or a **pneumatic tire roller**. The intermediate roller shall also roll closely behind the breakdown roller **and shall be either a steel-wheel roller or a pneumatic tire roller**. Finish rolling shall be accomplished by **a** steel-wheel roller operating in the static mode for the purpose **of** eliminating roller marks.

Rolling shall be continued until density is obtained in all portions of each course. Rollers and rolling procedures that result in crushing of the aggregate shall not be permitted. Compaction shall be sufficient to achieve field densities equal to or greater than 92% of the Maximum Theoretical Density as determined by tests made on specimens taken from the

compacted course in accordance with the requirements of 7.02 H, testing of completed Asphaltic Concrete Pavement.

Compaction necessary to achieve the specified 92% of the maximum theoretical density shall be accomplished before the surface temperature of the bituminous mixture falls below 175^{0} F. Subsequent lifts shall not be placed until the specified densities have been achieved, the temperature of the existing bituminous mat is below 175^{0} F, and placement does not cause deformation of the existing bituminous mixture.

Compaction in all places inaccessible to the rollers, such as locations adjacent to curbs, driveways, inlets manholes, valve boxes, monument boxes and other similar structures, shall be completed to the specified 92% density using a vibratory plate compactor.

(12) <u>Construction Joints</u>. Joints between old and new pavements or between successive days' paving work shall thoroughly and continuously bond the two pavements. The transverse construction joint between old and new pavements or between successive days' work shall be constructed by cutting the asphaltic concrete back for its full depth so as to expose a fresh, vertical surface. Before placing asphaltic concrete against the cut joint, the contact surface shall be sprayed or painted with a thin, uniform tack coat. Starter blocks shall be placed beneath the entire length of the paver's screed, front to back, when beginning placement of asphaltic concrete from the transverse construction joint. The paver's screed shall not be set directly on the previously laid mat and dragged off of the existing asphaltic concrete. The thickness of the starting blocks shall allow for the additional thickness for the asphaltic concrete. The approximate thickness of the starting blocks should be equal to the compacted lift thickness in inches multiplied by ¹/₄ inch per inch.

The height of the new asphaltic concrete above the existing mat shall allow for the additional thickness needed for placing the uncompacted lift prior to its' compaction to the required thickness for the asphaltic concrete; approximate height should be equal to the compacted lift thickness in inches multiplied by $\frac{1}{4}$ inch per inch. Any excess asphaltic concrete shall be bumped back onto the second lane with a lute or rake. Excess asphaltic concrete shall not be scattered across the fresh mat. Compaction of longitudinal construction joint shall be achieved by pinching the bumped excess asphaltic concrete down onto the joint. The longitudinal construction joints in successive courses shall be offset not less than 6 inches nor more than 12 inches. The widths and placements of the surface course shall conform to traffic lane lines. Joints shall be straight. If the pavement does not conform to all of these requirements, the plant production and paving operations shall be suspended until the deficiency is corrected.

G. <u>Surface Tolerances</u>. The surface shall be true to established crown and grade. The surface may be checked by the Engineer using a 10-foot straightedge at the Engineer's discretion. The maximum allowable variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed ¼ inch. Any areas with surface variations greater than the maximum allowable shall be corrected at the expense of the Contractor. The methods for corrections shall be diamond grinding, removal of the surface course by milling and overlay, overlaying with surface course or other methods as approved by the Engineer. The corrective measures shall be applied to the full lane width of the pavement and the corrected areas shall be squared normal to the centerline of the paved surface.
H. <u>Testing of Completed Asphaltic Concrete Pavement.</u> All lifts of asphaltic concrete shall be compacted and tested before the placement of a subsequent lift. Testing for density, and thickness shall be based on random core samples taken from each completed lift. The random test locations may be selected using the method described in Subsection 7.07 or by another random sampling technique approved by the Engineer.

Core samples of the completed lift shall be obtained by the Contractor or a certified testing laboratory retained by the Contractor. Cores shall be at least 4 inches in diameter. The Contractor shall furnish and operate an approved saw or core drill for cutting pavement samples. The equipment shall be capable of cutting the mixture without shattering the edges or otherwise disturbing the density.

The samples shall be tested and measured by a certified testing laboratory retained by the Contractor to determine the density of the asphaltic concrete. A single test shall be considered the average of three core samples taken at random locations throughout a block or within an intersection/cul-de-sac. Core samples shall not be taken closer than 3.0 feet to the toe of a curb or edge of pavement or within 1.5 feet of a construction joint. A minimum of one test (three cores) shall be taken for each block of completed lift, measured from ECR to ECR, and one test from each completed lift in an intersection or cul-de-sac. Results shall be reported to the Engineer in writing.

The Contractor shall patch the core locations with high strength non-shrink grout or other approved material.

I. <u>Basis of Acceptance</u>. Completed asphaltic concrete pavement shall be accepted based upon the following:

(1) <u>Surface Smoothness</u>. Asphaltic concrete pavement shall meet the surface tolerances specified in Subsection 7.02 G. Pavement not meeting these surface tolerances, after any necessary corrections, shall not be accepted.

(2) <u>Compacted Thickness</u>. Asphaltic concrete pavement shall be accepted for thickness where the thickness in a test area as specified in Subsection 7.02 H. is not more than 0.25 inches less than the thickness specified in the Project Documents. A test area shall be considered the average of three core samples taken at random locations throughout a block or within an intersection/cul-de-sac.

Where the thickness of the asphaltic concrete pavement in a test area is deficient by more than 0.25 inch, but not more than 1.0 inch, the pavement shall be accepted for thickness. However, payment for such deficient pavement shall be made at an adjusted price as specified in Table 7.02 I. (2). Deductions for deficient pavement thickness may be entered on any payment estimate after the information becomes available.

Where the pavement is more than 1 inch deficient in thickness, the Contractor shall remove such deficient areas and replace them with pavement of satisfactory quality and thickness. The Contractor shall receive no compensation for materials or labor involved in the removal or the replacement of deficient pavement. With the consent of the Engineer, the Contractor may leave the deficient pavement in place and receive no compensation or payment for such pavement. The area of pavement for which no payment is made shall be identical to the area of pavement which the Contractor would be required to remove and replace.

Deficiency in Specified	Proportioned Part of the
Pavement Thickness as Determined by Cores	Contract Price Allowed
0.00 to 0.25 inch	100%
0.26 to 0.50 inch	90%
0.51 to 0.75 inch	75%
0.76 to 1.00 inch	60%

TABLE 7.02 I. (2): PRICE ADJUSTMENT FOR PAVEMENT THICKNESS DEFICIENCY

(3) <u>Compacted Density</u>. Asphaltic concrete pavement shall be accepted for density where the density, tested as specified in Subsection 7.02 H., is equal to or greater than 92% of the maximum theoretical Marshall density. A test area shall be considered the average of three core samples taken at random locations throughout a block or within an intersection/cul-de-sac.

When the density of any individual lift in any test area is less than 92% and greater than or equal to 90.5% of the maximum theoretical Marshall density, the asphaltic concrete pavement within the test area will be accepted for density but payment shall be made at an adjusted unit price calculated as follows:

Adjusted Unit Price = (Contract Unit Price of Asphaltic Concrete) x (Specified Thickness of Lift Sampled divided by Total Specified Pavement Thickness) x (Appropriate Price Adjustment Factor as Specified in Table 7.02 I. (3))

Pavement Density as a Percentage of Maximum Theoretical	Proportioned Part of the
Marshall Density in Test Area	Contract Price Allowed
92.00% or above	100%
91.00% - 91.99%	80%
90.50% - 90.99%	70%
Less than 90.50%	0%

TABLE 7.02 I. (3): PRICE ADJUSTMENT FOR PAVEMENT DENSITY DEFICIENCY

Deductions for deficient density may be entered on any pay request after the information becomes available.

Where the density of any individual lift of asphaltic concrete pavement in a test area is less than 90.5% of the Maximum Theoretical Density, the Contractor shall remove the deficient area of asphaltic concrete pavement represented by the test and replace it with pavement material of satisfactory quality and density. Full depth pavement removal and replacement will be required if a bottom or intermediate lift is deficient. The Contractor shall receive no compensation for materials or labor involved in the removal and replacement of the deficient pavement.

(4) <u>Percent Air Voids – Total Mix.</u> Asphaltic concrete pavement shall be sampled and tested to determine percent air voids and conformance with the asphaltic concrete mix design at intervals corresponding to the production of approximately 500 tons of asphaltic concrete, but not less than one set of tests each day asphaltic concrete is produced, as specified in Subsection 7.02 F (3). Asphaltic concrete pavement shall be

accepted for air voids when the percent air voids are within the range of 3% to 5%. If the test results for percent air voids are outside of the specified range of 3% to 5%, payment will be made an adjusted price, as specified in Table 7.02 I (4). Deductions for deficient air voids will reflect the area of pavement represented by the corresponding 500 ton test sample. Deductions for deficient air voids in the total mix may be entered on any pay request after the information becomes available.

Measured %Air Voids - Total MixProportioned Part of the Contract Price Allowed3% to 5%100%2.5% to 2.9% or 5.1% to 5.5%70%< 2.5% or > 5.5%0% or Remove and replace at the discretion of the Engineer.

TABLE 7.02 I. (4): PRICE ADJUSTMENT FOR AIR VOID RANGE DEFICIENCY

(5) <u>Surface Condition</u>. The final surface of the asphaltic concrete shall be visually inspected by the Engineer. The surface finish shall be substantially free of tears, shoving, ruts, gouges, segregation, variations in texture, excessive variation at seams and center joints, corrugations or other irregularities identified by the Engineer. The Contractor will be required to repair deficient areas to the satisfaction of the Engineer. No payment will be made for correcting deficiencies in the pavement surface condition.

J. Bid Item, Measurement, and Payment.

(1) Bid Item:

(*) "ASPHALTIC CONCRETE Unit: Square Yard (nearest S.Y.)

(*) Specified Thickness of Asphaltic Concrete Pavement in inches.

(2) <u>Measurement.</u> "(*) Asphaltic Concrete" shall be measured by the area of the top of the asphaltic concrete pavement constructed. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square yard for each pay application. The portion of an asphaltic concrete base placed under curbs and the tapered/sloped portion of the pavement between the top and bottom of the pavement section at the pavement's edges shall not be measured.

(3) <u>Payment.</u> Payment for completed and accepted asphaltic concrete pavement, measured as provided above, shall be made at the Contract Unit Price for "(*) Asphaltic Concrete" per square yard subject to price adjustments for thickness, density, and air void deficiencies as stipulated in Subsections 7.02 I.(2), 7.02 I.(3), and 7.02 I.(4) above. Such payment shall be full compensation for the drying and screening of the aggregates; the mixing of the asphaltic cement with the aggregates; the preparation of the subgrade, unless bid as a separate bid item; the preparation of the base or surface to which the asphaltic concrete is applied; the application of prime and tack coats; the hauling, placing, finishing, and compaction of the asphaltic concrete; mobilization; providing all traffic control, unless provided by the owner or established as a separate pay item; and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work.

7.03 ASPHALT PAVEMENT PATCHING.

A. <u>Materials.</u> Unless otherwise specified in the Project Documents, materials used for patching asphalt pavement shall meet the requirements for asphaltic concrete pavement specified in Subsection 7.02 B.

B. Construction Requirements.

(1) <u>Initial Removal of Pavement</u>. The Engineer shall mark in the field the limits of the asphaltic concrete pavement to be removed and replaced. The pavement shall be removed by first saw cutting around the perimeter of the patch area to the full depth of the pavement to be removed. The Contractor shall remove and dispose of the pavement as Specified in Subsection 3.13.

i. <u>Removal of Pavement Containing Bricks (Projects within the City Limits</u> <u>Only)</u>. If the area to be patched has one or more underlying layers of brick, the requirements of Subsection 4.05 and the City of Topeka Brick Street, Alley and Sidewalk Policy shall apply. Upon encountering pavement containing bricks, the Contractor shall contact the City Street Maintenance Section and request instruction relative to preservation of the brick. The Contractor shall not proceed with any excavation of pavement containing brick until authorization from the Street Maintenance Section is received.

After the authorization to proceed has been received from the Street Maintenance Section, the Contractor may proceed with removal of bricks as specified in Subsection 4.05 and using care to not damage the bricks. The bricks, including those overlain with asphalt shall be salvaged to the Street Maintenance Section or disposed of as specified in Subsection 4.05.

(2) <u>Subgrade Stabilization</u>. After removal of the pavement, the Contractor shall request an inspection of the subgrade by the Engineer. If the Engineer determines that the subgrade is unstable, it shall be excavated to a depth determined by the Engineer and backfilled with Crushed Aggregate Base – Type AB-3 as specified in Subsection 3.12 or with other material as directed by the Engineer. The aggregate base shall be moistened and deposited in lifts not exceeding 6 inches and compacted to a minimum density of 95% of the standard density with moisture content of +/-3% of the optimum moisture or to the satisfaction of the Engineer when testing of the density of the material is waived by the Engineer. The installation and compaction of the aggregate base shall be paid for by the ton under the pay item "Aggregate Base – Type AB-3" Excavation of the subgrade shall be paid for by the cubic yard under the pay item "Unclassified Excavation".

(3) <u>Additional Pavement Removal.</u> Additional existing pavement shall be full depth sawcut and carefully removed by the Contractor to provide a minimum shoulder width of 9 inches of undisturbed subgrade on each side of the trench.

If the asphalt patching is necessary due to an excavation into the roadbed, the Contractor shall backfill the excavation as specified in Section 2.10 to the bottom of the adjacent pavement prior to removing additional pavement for the minimum 9 inch subgrade shoulder.

(4) <u>Placing the Patch</u>. The width from sawcut to sawcut shall be filled with asphalt (referred to in the following as "the patch") as specified in Standard Detail Drawing DT--007 and DT -008 and matching the thickness of the existing pavement. Pavements consisting of an asphalt overlay on concrete shall be replaced in kind as specified in the Standard Detail Drawing DT--007 and DT -- 008.

Before placing the patch, the Contractor shall clean the exposed edges of the existing pavement and apply a thin tack coat of emulsified asphalt to the clean edges of the existing pavement.

Asphaltic Concrete shall be placed and compacted from the depth of the bottom of the adjacent pavement to the final surface elevation in uniform layers of 3 inches or less. The Contractor shall compact each layer until no further consolidation is observed. The surface of the preceding layer shall be cleaned before the succeeding layer of asphalt material is placed. Where the patch area is designated to be finished as specified in Subsection 7.04, the patch asphalt shall be placed and compacted from the depth of the bottom of the adjacent pavement in uniform layers of 3 inches or less, leaving room for the specified depth of surface course.

When patches have a transverse width greater than 8.5 feet and a longitudinal length greater 10 feet, the final lift shall be placed with a paving machine and compacted with a breakdown roller.

All edges of patched areas shall be sealed with hot type joint sealant. Sealing of the edges of the patch is subsidiary to the patch.

C. Basis of Acceptance.

(1) <u>Surface Tolerances.</u> The surface of the patch may be checked by the Engineer using a 10-foot straightedge at selected locations at the Engineer's discretion. The maximum allowable variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed 1/4 inch. Any patch areas with surface variations greater than the maximum allowable shall be corrected at the expense of the Contractor.

(2) <u>Compacted Density.</u> Asphalt pavement patches shall be accepted for density where the density, is equal to or greater than 92% of the maximum theoretical Marshall density as tested by a nuclear densimeter. If the patch fails to meet these requirements, the Contractor shall remove and satisfactorily replace the patch to the satisfaction of the Engineer at no additional cost to the Owner.

(3) <u>Surface Condition</u>. The final surface of the asphalt patch shall be visually inspected by the Engineer. The surface condition of the patch shall be accepted if it is substantially free of tears, shoving, ruts, gouges, segregation, variations in texture, excessive variation at joints, corrugations, or other irregularities identified by the Engineer. The Contractor will be required to repair the deficient area to the satisfaction of the Engineer at no additional cost to the Owner.

D. <u>Bid Item, Measurement, and Payment.</u> Crushed rock surfacing used to repair subgrade for asphalt pavement patches shall be measured and paid for as specified in Subsection 4.07.

(1) Bid Item:

ASPHALT PAVEMENT PATCHING Unit: Ton (nearest 0.1 ton)

(2) <u>Measurement.</u> The asphaltic concrete filling the area between the final sawcuts shall be considered "Asphaltic Pavement Patching" and shall be measured as the weight of the material, to the nearest 0.1 Ton, installed. The weight shall be computed based upon the volume of the patch with individual dimensions measured to the nearest 0.1 foot and an assumed unit weight of 145 pounds per cubic foot. Sawcutting, removal of pavement, cleaning, applying emulsified asphalt tack, and compaction of the asphalt shall not be measured and shall be considered incidental to the item Asphalt Pavement Patching.

(3) <u>Payment.</u> Payment for completed and accepted asphalt pavement patches, measured as provided above, shall be made at the Contract Unit Price for "Asphalt Pavement Patching" per Ton. Such payment shall be full compensation for sawcutting, removal of pavement, cleaning, applying emulsified asphalt tack, placing and compaction of the asphalt; providing all traffic control, unless provided by the owner or established as a separate pay item; and for all labor, equipment, tools, supplies, and incidentals necessary to complete the work as specified

7.04 OVERLAYING ASPHALT PATCHING.

A. <u>General.</u> When indicated in the Project Documents asphalt patches shall be finished as specified herein.

B. <u>Materials.</u> Unless otherwise specified in the Project Documents, overlay materials used for patching asphalt pavement shall meet the requirements for asphaltic concrete pavement specified in Subsection 7.02 B.

C. <u>Construction Requirements.</u> An area surrounding the full depth repair area (the patch) shall be milled to a depth of 2 inches and the patch and milled area overlaid with 2 inches asphaltic concrete. Surface course milling shall meet the requirements of Subsection 7.05. The asphaltic concrete shall be constructed as specified in Subsection 7.02. Final mill and overlay limits shall be perpendicular to the centerline of the roadway unless approved otherwise.

(1) <u>Asphalt Pavements Less Than Three Years Old.</u> When the existing asphalt pavement is less than three years old, the area milled shall surround the patch to the width of the affected lane in the transverse direction and at least 10 feet beyond the patch in longitudinal directions. The milled area shall have at least one foot of milled surface surrounding all squared edges of the patch. If the milled area, as described above, extends into the adjacent lane, then the entire adjacent lane width shall also be milled. If the distance between two milled areas is closer than 20 feet, then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than 3 repair areas in a 100 foot section of street, then the areas shall be combined into one large mill and overlay area. The requirements set forth in this paragraph also apply to asphalt on concrete pavements that have an asphalt surface course less than three years old. (2) <u>Asphalt Pavements More Than Three Years Old.</u> When the existing asphalt pavement is more than 3 years old, the area milled shall extend 1 foot beyond each squared edge of the patch. If the distance between two milled areas is closer than 10 feet then the mill and overlay operation shall be extended to combine the areas into one area. If there are more than 3 repair areas in a 50 foot section of street, then the areas shall be combined into one large mill and overlay area.

D. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

ASPHALTIC CONCRETE

Unit: Square Yard (nearest 1 Sq. Yd.)

(2) <u>Measurement.</u> "Asphaltic Concrete" shall be measured by the area of pavement milled and overlaid. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square yard for each pay application.

(3) <u>Payment.</u> Payment for the completed and accepted milling and overlay of asphalt patch areas shall be made at the Contract Unit Price per square yard for "Asphaltic Concrete," which price shall be full compensation shall all materials, labor, equipment, hauling, stockpiling, and incidentals necessary to complete the work as specified.

7.05 COLD MILLING.

A. <u>Construction Requirements.</u> Cold milling shall consist of the removal of pavement surfaces to the depth and limits as indicated in the Project Documents or as directed by the Engineer. Milling will require grade lines using approved equipment automatically controlled with regard to longitudinal grade and cross slope.

The longitudinal termini of milled areas shall be sawcut transverse to centerline to provide a clean vertical edge and milled to a depth not less than 2 inches. Where through traffic crosses the edge of a milled area, or where traffic is being carried on a milled area, and the condition will remain overnight or for a longer period, temporary asphalt wedges 10-feet in length shall be constructed to smooth the transition from the normal pavement surface and the milled surface. Temporary asphalt wedges are subsidiary.

Unless otherwise indicated, all milled material shall be loaded into dump trucks and hauled by the Contractor to designated City or County stockpile locations.

B. Bid Item, Measurement and Payment.

(1) <u>Bid Item:</u>

COLD MILLING

Unit: Square Yard (nearest 1 Sq. Yd.)

(2) <u>Measurement.</u> "Cold Milling" shall be measured by the area of pavement milled. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square yard for each pay application. (3) <u>Payment</u>. Payment for the completed and accepted milling of pavement shall be made at the Contract Unit Price per square yard for "Cold Milling," which price shall be full compensation for all materials, labor, equipment, hauling, stockpiling, and incidentals necessary to complete the work as specified.

7.06 ASPHALT OIL PRICE ADJUSTMENT.

A. <u>General.</u> When the item "Asphalt Oil Price Adjustment" is included as a pay item in the Project Documents, the total Contract amount for asphaltic concrete work will be adjusted for variations in the price of asphalt binder material.

B. <u>Commencement and Timely Completion of Work.</u> The parties recognize that asphalt prices are volatile and that timely completion of the Project is essential. Upon Commencement of Contract time as defined in Section 2.3 of the General Conditions of the Project Manual, the Contractor shall begin work on the Project as soon as possible and pursue the work in an expeditious manner. The Contractor may not move off the Project without the written permission of the Owner. If the Contractor moves off the Project without the written permission of the Owner will discontinue additional payments to the Contract. However, deductions for asphalt oil price adjustments will continue to be applied regardless of whether or not the additional payments are discontinued for price increases. The Owner's written permission will not be withheld unreasonably.

- C. Bid Item, Measurement and Payment.
 - (1) Bid Item.

ASPHALT OIL PRICE ADJUSTMENT (*Maximum) Unit: Dollars (nearest \$0.01)

*Maximum price of adjustment in Dollars, bid form amount for this bid item will be set at \$0.00

(2) <u>Measurement.</u> When included as a pay item in the Project Documents, "Asphalt Oil Price Adjustment" shall be measured based upon an Asphalt Material Index (AMI) established by Shawnee County each month and the volume of asphalt constructed in that same month. Shawnee County will determine the AMI by averaging the rack prices for PG 64-22 as quoted to the County by Conoco Oil and Ergon Inc. in Kansas City. The County will publish the AMI monthly on the Shawnee County Public Works web page. The AMI for the month the Project Contract is let becomes the Starting Asphalt Index (SAI) for the project regardless of the grade of asphalt oil used on the project. The Contractor's bid price for each Asphaltic Concrete bid item shall be based on the SAI.

Asphalt Oil Price Adjustment (increases/decreases) will be included in each pay application based on the following computations:

Asphalt Oil Price Adjustment

= [(**Area of Asphalt Placed x [#]thickness x $^{\psi}$ 145 pcf x $^{\phi}$.05) / 2000] x "A"

Where: ``A'' = (AMI - SAI)

**Area of Asphalt Placed is the area of asphalt pavement constructed in a particular month and shall be measured as the surface area of the top of the asphaltic concrete pavement constructed. Dimensions of individual areas shall be measured to the nearest 0.1 foot, the areas computed, summed and rounded to the nearest square foot for each pay application. The tapered/sloped portion of the pavement between the top and bottom of the pavement section at the pavement's edges shall be measured.

[#]Thickness is in feet of corresponding pavement areas constructed in a particular month, which may not be the final plan thickness if all lifts have not been constructed.

 $^{\Psi}$ assumed unit weight =145 pcf

 $^{\phi}$ assumed oil in mix = 5%

Example:

Given the following: Area = 18,000 SF Thickness = 3" (.25') plan thickness SAI = \$400/ton AMI = \$450/ton for the month

Asphalt Oil Price Adjustment = $[(18,000 \times .25 \times 145 \times .05) / 2000] \times $50 = 815.63

(3) <u>Payment.</u> When included as a pay item in the Project Documents, payment or deductions for "Asphalt Oil Price Adjustment", measured as provided for above, shall be made as the project progresses by adjusting the item "Asphalt Oil Price Adjustment" on the Contractor's Applications for Payment. The Contractor shall prepare and submit a form similar to Form 1 on the next page:

Asphalt Oil Price Adjustment - Form 1

Month: July 2012 Contractor Name: <u>John Doe Paving, Inc,</u> Contract No <u>XXX</u> Project No. <u>XXX</u> Project Name: <u>NW ROUGH ROAD PAVING</u> Pay Applications: <u>4</u>

Asphaltic Concrete Paving Completed in June 2012

Station to Station	*Width (feet)	Thickness (feet)	Volume (cubic feet)	
10+55 to 11+25	10.00 to 12.00	0.58	446.60	
11+25 to 15+00	12.00	0.75	3375.00	
15+00 to 16+25	12.00 to 10.00	0.75	1031.25	
Total Volume of Asphalt = 4853				

*The tapered/sloped portion of the pavement between the top and bottom of the pavement section at the pavement's edges shall be measured.

Starting Asphalt Index (SAI) = $\frac{400.00}{100}$

Pay App. No. _____4___

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pay	Month	Total	Column (3)	(AMI) for	Change in	Asphalt Oil
App.	Paving	Volume	x 5% x	Month	Oil Price	Price
No.	Completed	(cubic feet)	(cubic feet) $(145/2000) =$ of Paving SAI - AMI	O) = of Paving SAI - AMI Ad		Adjustment
			Tons of Oil			Col. 4 x Col. 6
1	April	1000	3.625	\$440.25	40.25	\$145.91
2	May	4500	16.3125	\$450.00	\$50.00	\$815.63
3	June	0	0	NA	NA	0.00
4	July	4853	17.5921	\$335.65	-64.35	-1132.05
Total Asphalt Oil Price Adjustment = -\$170.51						

Article 3 of Document 530 of the Project Documents. Deductions for "Asphalt Oil Price

Deductions for "Asphalt Oil Price Adjustment" will be made for asphalt paving regardless of whether the Contract Time for Final Completion has expired or not.

7.07 RANDOM TEST LOCATIONS

A. <u>General.</u> It is intended that all test locations be selected in an unbiased manner. Random test locations may be selected using Method A described below or by another random sampling technique approved by the Engineer.

A single test shall be considered the average of three core samples taken at random locations throughout a block or within an intersection/cul-de-sac. A minimum of one test (three cores) shall be taken for each block of completed lift, measured from ECR to ECR, and one test (three cores) from each completed lift in an intersection or cul-de-sac. Core samples shall not be taken closer than 3.0 feet to the toe of a curb or edge of pavement or within 1.5 feet of a construction joint.

When a core location falls within an area that is not appropriate (i.e., a joint, a manhole lid), the location shall be moved 10 feet ahead on stationing as appropriate.

Date	Х	Y	Date	Х	Y	Date	Х	Y
1	0.290	0.170	12	0.183	0.530	23	0.389	0.170
2	0.119	0.760	13	0.669	0.310	24	0.626	0.710
3	0.594	0.510	14	0.971	0.860	25	0.930	0.440
4	0.953	0.140	15	0.314	0.400	26	0.742	0.230
5	0.784	0.420	16	0.508	0.720	27	0.473	0.680
6	0.284	0.800	17	0.877	0.130	28	0.203	0.870
7	0.576	0.250	18	0.193	0.610	29	0.504	0.400
8	0.069	0.540	19	0.430	0.770	30	0.913	0.590
9	0.691	0.780	20	0.751	0.240	31	0.620	0.320
10	0.973	0.290	21	0.508	0.460			
11	0.328	0.850	22	0.221	0.831			

B. <u>Method A Location Determination</u>. To determine the first random location for Method A, find the X and Y coefficient from the table below for the day of the month that the asphalt was placed.

Start with the beginning station of the block or intersection to be tested. Add the longitudinal distance to the first core location by multiplying the length of the block or intersection by the X coefficient for the day the asphalt was placed. Determine the transverse distance from the right edge of asphalt pavement by multiplying the asphalt width at that X location by the Y coefficient for the day the asphalt was placed. Both longitudinal and transverse distances should be rounded to the nearest 0.1 feet.

To calculate the next test location, determine the X and Y coefficients for the following day of the month. For example, if the day the asphalt was placed was the 10th, then the next location is calculated from the X and Y coefficients for the 11th. Calculate the longitudinal distance to the second core location by multiplying the length of the block or intersection by the X coefficient for the following day. Calculate the transverse distance from the right edge of asphalt pavement by multiplying the asphalt width at that X location by the Y coefficient for the following day.

The third location is determined by taking the X and Y coefficients for the second day following asphalt placement. From the example above, the second day would be the 12th. The longitudinal distance to the third core location is determined by multiplying the length of the block or intersection by the X coefficient for the second day. The transverse distance from the right edge of asphalt pavement is calculated by multiplying the asphalt width at that X location by the Y coefficient for the second day.

Example:

Beginning Block Station = 20 + 00Block Length = 500 feet Asphalt Pavement Width = 34 feet Day Asphalt was placed = 10^{th}

First Test Location: X coefficient for $10^{th} = 0.973$ Y coefficient for $10^{th} = 0.290$ First Test Location = $2000 + (500 \ge 0.973) =$ Sta. 24 +86.5 Transverse Offset = $(34 \ge 0.290) = 9.9$ feet from right asphalt pavement edge Second Test Location: X coefficient for $11^{\text{th}} = 0.328$ Y coefficient for $11^{\text{th}} = 0.850$ Second Test Location = $2000 + (500 \ge 0.328) =$ Sta. 21 + 64.0 Transverse Offset = $(34 \ge 0.850) = 28.9$ feet from right asphalt pavement edge

Third Test Location: X coefficient for $12^{th} = 0.183$ Y coefficient for $12^{th} = 0.530$ Third Test Location = $2000 + (500 \times 0.183) =$ Sta. 20 + 91.5Transverse Offset = $(34 \times 0.530) = 18.0$ feet from right asphalt pavement edge

END OF SECTION

SECTION 8

WATER MAINS, FIRE LINES AND WATER SERVICE LATERALS

8.01 GENERAL

A. <u>Scope</u>. The purpose of this Section is to govern the furnishing of all materials, labor, equipment, tools, superintendence, and other services necessary to construct water mains, fire lines, and water service laterals complete with appurtenances, including extensions and relocations, at the locations shown on the Drawings, and in conformance with these specifications. References herein are to Topeka/Shawnee County Standard Technical Specifications, unless otherwise noted.

B. <u>Warranty – One-Year Correction Period</u>. All work specified herein is specifically identified as being subject to a one-year correction period. If any work is found to be defective, including settlement, within the one-year period from the Final Completion date, the Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace it with non-defective work. Any leaks that appear within the one-year period after the date of Final Completion shall be repaired at the expense of the Contractor. The Contractor shall furnish a performance bond in an amount equal to the contract price of the work, to remain in effect during the one-year correction period.

C. <u>Traffic Control</u>. The Contractor shall provide work zone traffic control, as specified in Subsection 4.24, Work Zone Traffic Control, for all waterline work unless it is stated otherwise in the Contract Documents. Work zone traffic control shall be subsidiary to the water line work <u>unless</u> bid items for work zone traffic control are included in the Bid Form.

D. <u>Excavation, Backfill, Compaction, and Pavement Restoration</u>. All excavation, backfill and compaction for waterline work shall be as specified in Section 2, Trench and Structure Excavation, Backfill and Compaction. Unless otherwise indicated in the Project Contract Documents, all excavation, backfill and compaction for waterline work shall be subsidiary to other bid items.

Unless otherwise indicated in the Contract Documents, the Contractor shall complete the removal, replacement and restoration of pavements as necessary to complete waterline work as specified in Subsection 4.06, Pavement Removal and Replacement for Excavations. This work shall be paid for as indicated in the project bid items.

E. <u>Submittals</u>. Prior to Pre-Construction Meeting and before the start of work, the Contractor shall submit electronic copies of the following information to the Engineer for review and approval as indicated in Subsection 1.05, Shop Drawings and Engineering Data. Contractor shall include transmittal listing materials included with each submittal and a statement that "Contractor has reviewed included material(s) documentation and that same conform fully to the Drawings and Contract Documents requirements.

(1) Manufacturer's certification, representative test reports, and catalog cuts (as appropriate) for each material type and category proposed to be incorporated into the work for: pipe; fittings; valves and lids; hydrants; backflow devices; air release valves; tracer wire; tapping sleeves; meter and backflow device vaults; manholes and vaults; bedding and backfill materials; and all other appurtenances and accessories supplied.

(2) Maintenance manuals for all mechanical equipment installed into the work as requested.

(3) Manufacturer's Warranty documents shall become effective as of Substantial Completion date and respective expiration dates shall be listed with Contractor's transmittal to Engineer.

(4) Pipe laying schedule prepared by the Manufacturer for all ductile iron water line 16 inches in diameter and larger. This schedule shall be a station-to-station summary of all relevant information (e.g. size, thickness/classification, joint types, etc.) for all pipe, fittings, valves, and any other appurtenances to be incorporated into the Project.

F. <u>Coordination of Work</u>. All work shall be fully coordinated with other work, and submittals must be checked and approved for each of the trades. Conflicts in the sequence of the work shall be coordinated through consultation with the Engineer.

G. <u>Quality Assurance</u>. Items submitted for approval in accordance with requirements shown on the Project Documents shall be of the manufacturer indicated, or an Engineer approved equal, and in compliance with the approved Submittals in Subsection 8.01.E, Submittals, and as specified herein. All pipe, fittings, valves and boxes, and hydrants and appurtenances shall be manufactured in North America.

H. <u>Pre-Construction Survey</u>. Prior to start of any on site construction activities, the Contractor and the Owner, or his authorized representative, shall make a joint condition survey, after which the Contractor shall prepare an electronic copy or three (3) copies of a report indicating on a layout plan the condition of any damaged property or improvements adjacent to the work site and any variances from the Drawings. The report shall also contain electronic pictures or color photographs, 3.5" x 5" or larger, of damaged areas noted, along with a sufficient number of photos showing the physical features of the existing route before construction begins. All property that is damaged by the Contractor during the construction work shall be repaired or replaced as directed by the Engineer to like-new condition regardless of its physical condition prior to the start of construction.

8.02 MATERIALS

A. <u>Scope</u>. This section governs materials for pipe 2 inches in diameter through 24 inches in diameter, in accordance with sizes and materials shown on the Drawings. Pipe 10 inches in diameter and 14 inches in diameter shall only be used in repair situations subject to approval of Engineer. Any visible defect or failure to meet the quality standards herein will be grounds for rejection of those items.

All pipe and appurtenances are subject to inspection at time of delivery. Neither inspection nor failure to provide inspection shall relieve the manufacturer of the responsibility to provide materials that fully conform to these Specifications and Contract Documents. All materials found or identified to not conform to these requirements shall be made satisfactory or replaced.

B. <u>Pipe Types</u>. Pipe, joints and couplings (as applicable) shall be legibly and permanently marked with critical information, including: nominal pipe size, pressure class, dimension ratio, applicable conformance standards (e.g. ANSI/AWWA/ASTM), manufacturer's name, production record code, seal or mark of testing agency verifying suitability of pipe material for potable water service and for use in fire protection systems (e.g. UL/FM/NSF, as applicable).

DIP wall thickness shall be Class 51 for pipe 4 inches in diameter through 24 inches in diameter, unless otherwise indicated on the Drawings. All PVC and FPVC pipe shall be pressure class 235 unless otherwise indicated on the Drawings. All PVCO pipe shall be pressure class 305, unless otherwise indicated on the Drawings.

(1) <u>Ductile Iron Pipe (DIP</u>). DIP shall be used for all pipes larger than 12 inches in diameter unless alternate materials are shown on the Drawings, and may be used for pipe 12 inches in diameter and smaller, subject to approval of the Engineer. All pipe and pipe joints shall be bell and spigot, push-on type (e.g. American Fastite, U.S. Pipe Tyton) or welded, boltless restrained joint type (e.g. American Flex-Ring, U.S. Pipe TR Flex), and shall be AWWA C151/ANSI A21.51, as indicated in the Project Documents. Acceptable manufacturers are American, US Pipe and McWane Ductile or Engineer approved equal.

The exterior of ductile iron pipe shall be undercoated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes – External zinc based coating – Part 1: Metallic zinc with finishing layer, Second edition 2004 06-01."

Exterior coatings shall be bituminous coal tar base Not Less Than (NLT) 1 mil thick in accordance with AWWA C151/ANSI A21.4. Inside coatings for use under normal conditions shall be cement-mortar lining in accordance with AWWA C104, unless otherwise specified, with a seal coat of bituminous coal tar base material in accordance with ANSI A21.4. The finished bituminous coating shall be continuous and smooth, neither brittle when cold nor sticky when exposed to the sun in accordance with AWWA C151, and shall be strongly adherent to the pipe. Rubber joint gaskets shall be in accordance with AWWA C111/ANSI A21.11. Joint lubricant must be labeled with manufacturer's name and conform to ANSI A21.11. Normal laying length is 20 feet. Restrained joint pipe and welded thrust collar pipe shall be factory fabricated by only the pipe manufacturer.

(2) <u>Polyvinyl Chloride Pipe (PVC)</u>. PVC may be used for all pipe 4 to 12 inches in accordance with the Contract Documents. All pipe shall be manufactured in accordance with AWWA C900. Pipe joints shall be bell and spigot, push-on type with integral elastomeric gasket, in conformance with ASTM D3139 and ASTM F477. If PVC is used for less than 4 inches, pipe shall be SDR-21 per ASTM D2241 or Engineer approved equal.

Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign material, blisters, and other visible deleterious faults. Pipe shall be manufactured from rigid polyvinyl chloride compound with cell classification 12454-B as defined in ASTM D1784. Normal laying length is 20 feet.

(3) <u>Fusible Polyvinyl Chloride Pipe (FPVC)</u>. FPVC may be used for all pipe 4 inches in diameter through 24 inches in diameter, in accordance with the Contract Documents and as approved by the Engineer. All pipe shall be manufactured in accordance with AWWA C900 or C905. The ends shall be extruded with plain ends and shall be square to the pipe and free of any bevel or chamfer.

Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters or other visible deleterious faults. Pipe shall be manufactured from rigid polyvinyl chloride compound with cell classification 12454-B as defined in ASTM D1784. Normal laying length is 40 feet.

(4) <u>Molecularly Oriented Polyvinyl Chloride Pipe (PVCO)</u>. PVCO may be used for all pipe 6 inches in diameter through 12 inches in diameter, in accordance with the Contract Documents and as approved by the Engineer. All pipe shall be manufactured in accordance with AWWA C909. Pipe joints shall be bell and spigot, push-on type with integral elastomeric gaskets conforming to ASTM D3139.

Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters or other visible deleterious faults. Pipe shall be manufactured from rigid polyvinyl chloride compound with cell classification 12454-B in accordance with ASTM D1784. Normal laying length is 20 feet.

(5) <u>Restrained Joint Polyvinyl Chloride Pipe (RJ-PVC)</u>. RJ-PVC may be used for pipe 12 inches in diameter and smaller, in accordance with the Contract Documents and as approved by the Engineer. All pipe shall be manufactured in accordance with AWWA C900. Pipe joints can be non-metallic mechanically restrained elastomeric bell and spigot joints of either coupled or integral bell type in conformance with ASTM F477 and AWWA C900 or corrosion resistant steel.

Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters or other visible deleterious faults. Pipe shall be manufactured from rigid polyvinyl chloride compound with cell classification 12454-B as defined in ASTM D1784. Normal laying length is 20 feet.

(6) Mechanical Joint (MJ) Restraints. Ductile iron radial type bolt MJ restraints for mechanical joint applications designed for respective pipe material being used and for MJ fittings and valves. Split-ring restraints will not be permitted on new construction except under special circumstances. All restraint devices shall be of uniform thickness and utilize a standard MJ gasket and match standard MJ bolt circle, using 304/316 SS bolts and nuts (Teflon coated) required for installation. The wedge screws shall be compressed to the outside wall of the pipe, after fully setting the joint, with twist-off torque calibrated bolts/nuts to ensure proper actuating of the MJ restraint. Coatings shall be petroleum asphalt per AWWA C151/ANSI A21.51or with epoxy coating per AWWA C550. Restraint device shall be designed for a minimum working pressure of 350 psi. Retainer glands are only required where noted on the Drawings, although for piping smaller than 12 inches in diameter, retainer glands may be used in locations where a restrained joint (RJ) is required. Retainer glands without blocking are not an acceptable RJ for piping larger than 12 inches in diameter. Acceptable manufacturers include ROMAC Grip Rings and EBAA Iron Mega-Lugs or Engineer approved equal. For AWWA C909 PVCO pipe materials requires Engineer approval of proposed Restraint Glands.

C. <u>Pipe Fittings</u>. All tees, bends, crosses, plugs/caps, sleeves, and offset style fittings shall be ductile iron, mechanical joint style, pressure class 350 psi for fittings 24 inches in diameter and smaller, pressure class 250 psi for fittings larger than 24 inches in diameter. All fittings shall be manufactured in conformance with AWWA C110/ANSI A21.10 (full-body), A21.11 and AWWA C153/ANSI A21.53 (compacts), as manufactured by American, Tyler Union, or Engineer approved equal. All fittings shall be lined and coated as specified for DIP. Fittings for pipe sizes smaller than 12 inches in diameter may be compact type with full body glands. Fittings 12 inches in diameter and larger shall be full body.

MJ swivel x solid adapter fittings shall be used between fittings and valves where called for on the Drawings or as needed to facilitate the Work, and 90-degee swivel x swivel adapter fittings may be used for installation of branch valves for hydrants. Fabricated swivel adapter fittings shall not be acceptable.

All underground fitting, valve and hydrant joints shall be furnished with Type 304/316 SS bolts and nuts (Teflon coated) or with 316 SS T-head and all nuts shall be Teflon coated. When indicated on the Drawings or provided by the Contractor, tie-rods shall be 316 SS with Teflon coated nuts and duc-lugs, either all-thread or eye-bolt type.

D. <u>Sleeves</u>. Solid sleeve lengths shall be 12 inches or longer in overall length, based on pipe size. The solid sleeve shall be capable of having two plain ends of pipe inserted into opposite ends of the sleeve. The sleeve is then to be sealed to the pipe by a mechanical joint at each end of the sleeve in accordance with AWWA C111/ANSI A21.11, with gaskets made of EPDM rubber. The follower retainer gland shall be manufactured from ductile iron at least ASTM A536, Grade 70-50-05 in accordance with AWWA C111/ANSI A21.11. All sleeves shall be manufactured of ductile iron, with lining and coatings as specified for DIP. Solid sleeves shall be manufactured in accordance with AWWA C153/ANSI A21.53 for under 12 inches and AWWA C110/ANSI A21.10 for 12 inches or greater. All sleeves shall be rated for a minimum working pressure of 250 psi.

Special bolted compression couplings may be specified or used to connect new to existing mains of unknown OD using dedicated range, limited range or wide range couplings as approved by Engineer for sizes 2" - 24" nominal diameter in accordance with AWWA C219. Acceptable suppliers include Hymax and Romac, or Engineer approved equal.

E. <u>Tapping Sleeves</u>. Tapping sleeves shall be Power Seal Pipeline Products Model 3490AS MJ, Ford FTSS MJ, Mueller H-304MJ, JCM 439 or Engineer approved equal. Tapping sleeves shall be stainless steel Grade 18-8, Type 304 per ASTM A240, full circle gasket type. All nuts and bolts shall be stainless steel (type 304) and Teflon coated nuts per ASTM A193 and A194. Outlet shall be integral MJ.

F. <u>Valves and Valve Boxes</u>. Generally, and unless otherwise directed by the Engineer, MJ gate valves shall be used on all water mains smaller than 12 inches diameter. Generally, and unless otherwise directed by the Engineer, MJ butterfly valves shall be used on all water mains 12 inches diameter and larger. Valves shall be NSF61 certified and be for buried service. The size and location of valves shall be as shown on the Drawings. Valve ends shall be of the mechanical joint type, conforming to AWWA C111/ANSI A21.11.

(1) <u>Gate Valves</u>. All gate valves shall be resilient-seated, pressure class 250 psi, MJ ductile iron body, bronze mounted with non-rising stems sealed with 3-O ring seals, clockwise to open, with 2-inch square operating nuts painted red. Gate valves shall conform to all applicable requirements of AWWA C509 or AWWA C515, and shall be epoxy coated inside and outside with NLT 8-mils DFT conforming to AWWA C550. All exposed valve bolts and nuts shall be 304/316 stainless steel with Teflon coated nuts conforming to ASTM 276.

The valve bonnet shall have a removable thrust plate to permit the removal and replacement of the valve stem and "O" ring seal while the valve is in service. All bolts and nuts in bonnet shall be stainless steel. Acceptable resilient wedge gate valve manufacturers include Mueller Series A-2360 (A-2361-20 or A-2362-20), American Series 2500 MM or Engineer approved equal.

(2) <u>Butterfly Valves</u>. All butterfly valves shall be minimum 200 psi, MJ cast or ductile iron body, configured with a horizontal valve shaft and a vertical actuator shaft with 2-inch square operating nuts painted red, clockwise to open. Butterfly valves shall be fitted with Buna-N seats, type 304 SS, 316 SS or 630 SS shaft, cast iron with 316 SS edge disc, and nylon self-lubricating shaft bearings, conforming to AWWA C504 Class 150B, and epoxy coated inside and outside conforming to AWWA C550. Valve discs shall seat at 90 degree with the pipe axis.

Each valve shall be provided with an operator with a torque rating at least equal to the torques and turns-to-open listed in AWWA C504. Operators shall be designed for buried service, totally enclosed, permanently lubricated link lever traveling nut type designed to hold the valve in any intermediate position between full-open and closed. Operator shall be provided with a stop-limiting device capable of withstanding input torque of 300 ft-lbs at extreme operator positions without damage to operator or valve.

The valve bonnet shall have a removable thrust plate to permit the removal and replacement of the valve stem and "O" ring seal while the valve is in service. All bolts and nuts in bonnet shall be stainless steel. All exposed valve bolts and nuts shall be 304–316 stainless steel. Valves shall be manufactured by the Henry Pratt Co., "Ground Hog", Model to the City of Topeka standard, with no exceptions.

(3) <u>Extension Stems</u>. Extension stems shall be fabricated from solid steel shafting not smaller in diameter than the stem of the valve. All connections shall be non-pinned. Pipe couplings will not be acceptable.

Extension stems shall be provided for buried valves when the operating nut is more than 5 feet below finished grade. Each extension stem for a buried valve shall extend to within 1 foot of the finished ground surface, NO EXCEPTIONS WILL BE ALLOWED, and shall be provided with spacers, which will center the stem in the valve box, and shall be equipped with a 2-inch wrench nut painted Red.

(4) <u>Valve Boxes, Bases, Lids and Covers</u>. All buried valves shall be provided with valve boxes. Valve boxes shall be 6-inch, PVC AWWA C900 Pressure Class 235 pipe. Lids outside the traveled roadway will be "mushroom" or "flat top" Clay & Bailey No. 2615-6 lid pattern with only "WATER" imprinted and shall be cast iron or steel Engineer approved equal.

Cast iron Lids and Covers in pavement and gravel shall be Clay & Bailey No. 2196 or Engineer approved equal. All parts of valve box extensions, lids, and covers shall be coated by dipping in bituminous 'varnish'.

Valve boxes that need extensions must be extended by approved method. All risers need to be sealed to prevent debris and infiltration.

(5) <u>Air Release and Combination Valves</u>. When required on the Drawings, air release valves or combination air-release and vacuum-relief valves shall be installed with a 1-inch saddle tap and corporation valve on top centerline of pipe at highest elevation (2-inch on pipe sizes 16 inches or larger). The valve shall be set in a 1-inch service City Standard Meter Pit, with Top being removable and finished to grade.

Air Release Valve shall be float operated and shall incorporate a simple lever mechanism to enable the valve to automatically release accumulated air from a fluid system while that system is pressurized and operating. The isolation valve will normally be manually closed. The Air Release Valve shall close drop tight. All internal metal parts shall be of stainless steel, withstanding a test pressure of 1000 psig. The linkage/lever mechanism shall be designed to prevent jamming. The body and cover shall be of cast iron conforming to ASTM A126 Class B, shall be epoxy coated and shall be designed to withstand a test pressure of 450 psig.

The open end of the air relief pipe from an automatically operated valve shall be extended to at least 1 foot above grade and provided with a screened, downward-facing elbow. The open end of the air relief pipe from a manually operated air relief valve should be extended to the top of the pit.

For a vacuum relief valve, the open end of the relief pipe from a manual or automatic combined air/vacuum relief valve shall always be extended to at least 1 foot above grade and provided with a screened, downward-facing elbow.

All piping and isolation valves shall be brass except for the air outlet from the valve, which shall be cast iron or aluminum tubing which shall be painted. Each valve assembly shall be installed complete. Acceptable manufacturers include APCO Valve 143C/149C, G.A. Industries 945/960C, Val-Matic 201C/202C/204C or Engineer approved equal.

(6) <u>Temporary Blow-off Valve Assemblies</u>. Temporary blow-off assemblies for pressure testing and disinfection shall be provided for 1", 1.5" or 2" sizes or as approved by the Engineer.

G. <u>Dry-Barrel Fire Hydrants</u>. The hydrant shall be furnished with a 6-inch MJ inlet, have two 2.5-inch NST hose nozzles and a 4.5-inch pumper nozzle with City of Topeka standard thread, be traffic model with breakaway flange or coupling and safety stem, and in accordance with AWWA C502. All nozzles shall be of bronze, with outlet nozzle caps made of cast iron. A recess shall be provided at the inner back edge of cap threads to retain a replaceable gasket, with cap non- kinking chain securely attached, and with tapered operating/nozzle cap nuts per City of Topeka standard (7/8-inch square at base by ³/₄-inch square at end, 1 to 2 inch long).

Hydrants shall have compression type 5.25-inch main shut-off valve, close with pressure and be equipped with replaceable minimum dual O-ring shaft seals, and capable of 200 psi working pressure and 400 psi test pressure. The unit shall be fully bronze mounted with replaceable bronze seats, bronze cap nut and weather cap. Direction to OPEN shall be Clockwise, with an arrow and the word "OPEN" shall be cast in relief on the hydrant top to indicate direction of opening. Hydrants shall be furnished with all restrained type joint glands, Buna-N gaskets, Type 304/316 SS bolts and nuts (Teflon coated) required for installation.

Hydrant shall have standard minimum depth of bury of 4 feet except where the hydrant bury depth is indicated on Drawings. Contractor shall furnish and install barrel extensions as required to fit final hydrant bury depth and finished grade requirements and as shown on the Contract Documents. Extensions shall be in 6-inch increments with the least number of extensions practicable to conform to the final hydrant bury depth required.

Hydrant main valve assembly shall include an automatic drain system that consists of NLT two openings that are bronze or bronze-lined in the valve seat that are force flushed each time hydrant is operated and when hydrant valve is closed, the water retained in the body during operation will drain to the gravel placed around hydrant base or shoe, and close when hydrant is flowing. Drain valve seals shall be long-life, non-metallic material that are mechanically secured by non- corrosive fasteners. The drain system shall be free of devices requiring field adjustment. All surfaces of drain channel shall be bronze or they shall be protected with factory applied epoxy coating per AWWA C550. Hydrant shall be painted with one-coat zinc-chromate primer (NLT 3-mils DFT) and two-coats premium enamel (each 3-mils DFT, 6-mils total). Buried portion shall have top coats black and brite hydrant red on exposed hydrant body. Pumper nozzle caps on all <u>private</u> hydrants, as designated by the Water Engineer, shall be painted Sherwin-Williams industrial yellow # B54- Y37.

Friction losses through hydrant shall not exceed 2.5 psi at 1,000 GPM through pumper nozzle when tested per AWWA C502. Acceptable Fire Hydrant manufacturers include Mueller Type A-423 or American Darling Model B-84-B-5 or Engineer approved equal. All hydrants shall have manufacturer 5-year Warranty on materials and workmanship.

H. Tracer Wire. All water mains shall be installed with tracer wire for locating. Tracer wire for Open-Trench construction shall be minimum 12 AWG solid, steel core soft drawn tracer wire, average 250 lb. tensile break load with Blue color 30- mil high molecular weight-high density polyethylene (HMW-HDPE) jacket complying with ASTM D1248, 30-volt rating; For Horizontal Directional Drill (HDD) construction wire shall be minimum 12 AWG solid, steel core hard drawn extra high strength wire, average 1150 lb. tensile break load with Blue color 45-mil HMW-HDPE jacket complying with ASTM D1248, 30-volt rating; For Pipe Bursting construction wire shall be minimum 7x17 stranded copper clad steel wire, average 4,700 lb. tensile break load with Blue color 45-mil HMW-HDPE jacket complying with ASTM D1248, 30-volt rating and minimum of 21% conductivity as manufactured by Copperhead Industries, LLC, or Engineer approved equal. To make wire connections watertight and to prevent corrosion or any deterioration of electrical conductivity in the future, the twisted bare ends shall be sealed using Copperhead Industries LLC Type 3WB-01, SCB-01SR or SCB-01 (as applicable) or Ideal Twister DB Plus wire connectors designed to be a water resistant connector for wet, damp or corrosive wiring conditions and intended for direct burial or Engineer approved equal. Tracer wire shall terminate at a SnakePit magnetized tracer box, as manufactured by Copperhead Industries, LLC, or Engineer approved equal. For off-pavement installations, use SnakePit model LD14*TP. For concrete and driveway installations, use SnakePit model CD14*TP. All boxes shall be equipped with a blue ABS cover.

All tracer wire shall be connected to anodes at all dead ends and stubs, as shown on drawings. Anodes shall be manufactured by Copperhead Industries, LLC or Engineer approved equal. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 HDPE copper clad wire connected to anode (minimum 1.0lb.) specifically manufactured for this purpose, and buried at the same elevation as the utility.

I. <u>Corrosion Protection</u>. All ductile iron pipe, fittings and buried hydrant barrels shall be protected from corrosive soils and bury conditions by wrapping with NLT 8-mil thick blue polyethylene tubing or sheeting conforming to AWWA C105 and sized for the pipe diameter being protected. Securing tape shall be 2-inch wide by 10-mil thick with one side adhesive and supplied with the poly-wrap by the supplier.

J. <u>Bedding Aggregate</u>. Bedding material for all direct buried pipe shall be crushed limestone (1/4" CHIP) and bedding shall fully encase the pipe from NLT four inches below bottom of pipe barrel to NLT six inches above top of pipe bell, and trench wall to trench wall. When pipe line trench is in shale or in rock, an additional six inches of bedding material shall be placed under the pipe barrel. Bedding aggregate should have the following characteristics:

Retained on No. 4 Sieve	20%	$\pm 10\%$
Retained on No. 8 Sieve	94%	
Retained on No. 100 Sieve (wash) not less than	98%	
Deleterious Substances, (max)	5%	

K. <u>Poured Concrete</u>. Concrete used for buttress, thrust blocking and anchorages shall be minimum 3,000 psi at 28 days and shall be made with either Type I or II cement as indicated in Section 5 Structure Class Concrete. If 1 % calcium chloride is added to concrete mix, Type I cement shall be used with strength of 4,000 psi at 28 days. Slump shall not exceed 3 inches.

L. <u>Water Services</u>. All new water service piping shall have minimum 1-inch nominal diameter from the main to the meter/setter. Service materials shall be NSF 61 and NSF 372 product certified as applicable.

(1) <u>Tapping Pipe Saddles</u>. For 2-inch mains, saddle shall be style model Ford S90xxx Style A fabricated with stainless steel band and bolts with Teflon coated nuts and epoxy coated saddle fitted with heavy duty EPDM gasket sized for the pipe line material. For <u>4-inch and larger mains with 1 - 1.5 - 2-inch tap sizes</u>, saddle shall be 2-piece bolted style model Ford S90-xxx Style A, 202B-xxx or 202BS-xxx per AWWA C800/ASTM B62 & B584, with AWWA tap threads and machined to rigid standards, with EPDM rubber gasket bonded in place per ASTM D2000, with lower saddle of 18-8 type 304 stainless 3.25-inch wide band and with four 18-8 type 304 stainless 5/8-inch bolts welded to band and passivated to resist corrosion having coated SS hex nuts and SS washers.

(2) <u>Corporation Stops</u>. For Service pipe sizes 1 through 2-inch, corps shall be Ford Ballcorp model FB-1000-xx AWWA "CC" inlet threads in conformance with AWWA C800. In situations of a metal service line is installed (or existing) that is connected to a metal water main (installed or existing), a service insulator shall be installed for protection against service/main line electrolysis by using a Service Insulator.

(3) <u>Adaptive Couplings</u>. All copper and HDPE tubing couplings shall be Grip Joint Couplings and insert stiffeners, including copper gaskets when appropriate, as follows:

	i. <u>Straight Couplings</u> :	
	Joint Coupling for copper or plastic tubing	Ford C44-xx
	Male Iron Pipe for copper or plastic tubing	Ford C84-xx
	Female Iron Pipe for copper or plastic tubing	Ford C14-xx
	Female Copper Thread for copper or plastic tubing	Ford C04-xx
	ii. <u>Quarter Bends</u> : Pack Joint Ell Coupling x Copper or Plastic Tubing	Ford L44-xx
	iii. <u>Ball Valve Curb Stop (when required)</u> : Ball valve for copper or plastic tubing	Ford B44-xxx
	 iv. <u>Insert Stiffeners – stainless steel inserts</u>: 304 tubular stainless steel insert (ASTM 240-92B) 	INSERT-xx style
er	vice Pipe. Water service piping for 1 to 2-inch water ser	vices shall be eithe

(4) <u>Service Pipe</u>. Water service piping for 1 to 2-inch water services shall be either Type K soft copper or high density polyethylene (HDPE) DR-9 tubing with CTS size, conforming with AWWA C901, with joints meeting AWWA C800 standards. All HDPE tubing shall utilize solid 304 tubular stainless steel insert stiffeners,

dimpled and flanged to retain placement within the service line. <u>4-inch and Larger Service Pipe</u>. Water service piping, fittings and valves and appurtenances shall conform with Section 8.02 for respective components.

(5) <u>Meter Setters</u>, <u>Meter Boxes/Pits</u>, <u>Rings and Covers</u>, and <u>Extension Rings</u>, <u>Meter and Meter Reading Unit</u>. Shall be in conformance with the City of Topeka Water and Sewer Utilities Installation Standards.

M. Bid Items, Measurement and Payment.

(1) <u>Bid Items:</u>		
(*) WATERLINE (size, class and material)	Unit: LINEAL FOOT	(nearest L.F)
(*) TEE AND BLOCK (size)		Unit: EACH
(*) CROSS (size)		Unit: EACH
(*) BEND AND BLOCK (size, degree bend)		Unit: EACH
(*) REDUCER (size)		Unit: EACH
(*) ANCHOR SPOOL FITTING (size and type)		Unit: EACH
(*) CONCRETE THRUST COLLAR		Unit: EACH
(*) SLEEVE (size)		Unit: EACH
(*) TAPPING SLEEVE (size)		Unit: EACH
(*) GATE VALVE & EXTENSION STEM (size)		Unit: EACH
(TAPPING Sleeve VALVE to be bid per GATE Valve si	ze)	
(*) BUTTERFLY VALVE & EXTENSION STEM (size)		Unit: EACH
(*) VALVE BOX AND COVER (Turf)		Unit: EACH
(*) VALVE BOX AND COVER (Pavement, etc)		Unit: EACH
(*) AIR RELEASE VALVE / ENCLOSURE (by type)		Unit: EACH
(*) TEMPORARY BLOW OFF VALVE ASSEMBLY		Unit: EACH
(*) FIRE HYDRANT AND BLOCK		Unit: EACH
(FIRE HYDRANT BRANCH VALVE to be bid per Gat	e Valve)	
(FIRE HYDRANT BRANCH PIPE to be bid per WATE	CRLINE)	
(*) FIRE HYDRANT EXTENSION (*) TARDING SADDLE & CORDORATION STOP (by size)		Unit: VF
(*) SEDVICE DIDE (Type & Conner on HDDE) (cize)		Unit: EACH
(*) SERVICE FIFE (Type & Copper of HDFE) (size) (SERVICE CONNECTION DIDE > 22 to be hid non W/	Unit: LINEAL FOOT	(nearest L.F.)
(SERVICE CONNECTION FIFE $> 2^{\circ}$ to be blu per wP (*) TADDING SADDLE (by Main & Tap Sizes)	IEKLINE)	
(*) COPPODATION STOP VALVE $()$		Unit: EACH
(*) CORPORATION STOP VALVE (SIZE) (*) INSTALL METED METED BOX/DIT AND TOD (size)		Unit: EACH
and type)		Unit: EACH
(*) CONNECTION AT STATION XX+XX (location)	Unit:	LUMP SUM
(*) = nominal diameter of pipe or fitting, etc. XX+XX = Plan location of connection		

(2) <u>Measurement</u>. Waterlines shall be measured along the installed pipe to the nearest foot. Fittings, blocks, collars, sleeves, saddles, and valves shall be measured per each of the various sizes and types installed. Hydrants, valve boxes and covers shall be measured per each installed. Connections to existing water lines shall be measured by the lump sum at each of the various locations such connections are made.

(3) <u>Payment.</u> Payment for completed and accepted work shall be made at the Contract unit price, which payment shall be full compensation for all excavation, materials, dewatering, bedding, laying, testing, backfilling, compaction and grading as specified; and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

8.03 CONSTRUCTION/INSTALLATION REQUIREMENTS.

The Contractor shall investigate all conditions affecting the work, arrange work procedures and schedule accordingly, and have, on hand, such pipe, fittings, valves hydrants, accessories and bedding materials required and necessary to meet the project site conditions and provide a complete installation. Generally, construction and material installation shall conform to AWWA C600, "Installation of Ductile Iron Water Mains and Their Appurtenances", AWWA C605 "Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings" and AWWA Manual M23, "PVC Pipe Design and Installation".

All work shall be performed and materials installed by qualified, trained and competent workmen in strict accordance with the manufacturer's instructions and recommendations. Material suppliers shall have a responsibility to provide the Contractor services of a field representative to instruct and train the Contractor on proper handling and installation of water pipe line materials as outlined in this document.

New piping shall be laid to the elevations shown on the Drawings. Before installing new piping in any location where doing so will result in less than 42 inches of cover, the Contractor shall coordinate with the Project Representative for Engineer approval. In locations where new piping is installed beneath pavement, cover is measured from the bottom of pavement to the top of pipe.

A. <u>Pipe and Materials Handling</u>. All pipe, fittings, valves, hydrants and accessories shall be checked by the Contractor immediately upon delivery to the work site for compliance with this Specification and conformance to Engineer Approved Submittals and for damaged or defective material(s). Improper handling of pipe, fittings, valves, hydrants and accessories resulting in damage to respective material item(s) will be grounds for rejection of said material(s). Any damaged or defective material(s) so identified shall be moved to separate nearby location and shall be removed from the work site within 24 hours of discovery.

Handling (equipment) procedures shall be in accordance with the approved manufacturer's recommendations/guidance for proper handling of products to prevent harm to material(s) coatings and linings. Improper handling of pipe or materials which results in damage to interior lining or exterior coatings will be grounds for rejection of said items from installation. The Engineer will be the sole judge as to the acceptability of any material item as being acceptable or not for installation into the work. Hooks shall not be used. Under no circumstances shall pipe or accessories be dropped or dumped.

Cutting of ductile iron pipe is discouraged, and the Contractor is urged to plan his job to minimize the necessity for cutting. Cutting of ductile iron pipe that absolutely must be done for insertion of valves, fittings, or closure pieces shall be by use of manufacturer approved cutting equipment, such as abrasive pipe saw, rotary wheel-cutter, guillotine pipe saw, milling wheel saw, or roller-chain cutter. Cut ends and rough edges shall be ground smooth and true, and for push-on joint connections, the cut end shall be beveled by methods recommended by pipe manufacturer. Pipe cuts for push-on joints shall be field marked for proper insertion lengths. The work shall be done by workman trained and experienced in pipe cutting and shall be accomplished in such a manner so as to not damage the lining or coating of the pipe. Prior to installation, and lastly while suspended for placement into the trench, each pipe and fitting shall be inspected for defects, cracks and other deficiencies. The interior of all pipes, fittings and valves shall be thoroughly cleaned of all foreign matter before installation and shall be kept clean thereafter until the line is placed into service and should thereafter be swabbed with a 1 percent free available chlorine solution. Any coating damaged by the Contractor shall be repaired or replaced before placement into the work. Damaged exterior coating shall be recoated to the satisfaction of the Engineer by applying coal-tar or other coating material as specified for the original coating for the protection of the materials being installed.

B. <u>Grading and Excavation</u>. Grading and excavation preparatory to pipeline and appurtenance construction shall be performed in accordance with Section 3, Earthwork and Grading. All trenching shall be performed in accordance with Section 2, Trench and Structure Excavation, Backfill and Compaction.

Grading and excavation shall be performed in a safe and proper manner with suitable precautions being taken against all hazards. The Contractor shall explore and expose any and all obstructions in advance of excavation so that minor changes in grade and alignment may be made by the Engineer when required by field conditions. In paralleling existing water, furnish temporary service to the consumers with minimum interruption until permanent service can be restored by the Contractor.

C. <u>Trench Excavation</u>. The Contractor shall not open more trenches in advance of pipe laying than is necessary to expedite the work. One block or 300 feet whichever is the shorter, shall be the maximum length of open trench ahead of pipe laying unless by written permission of the Engineer. Except where Tunneling, Boring, Jacking, HDD or Pipe Bursting is specified and shown on the Drawings, all trench excavations shall generally be open-cut.

The Contractor shall excavate the bottom of the trench to the line, grade and elevation as required on the Drawings and in this Specification. The excavation and the width of the trench shall be as specified in the City of Topeka's Standard Drawing Details. If the water main is being installed in a location where pavement is not otherwise planned for removal or replacement as a part of the same project, pavement removal shall be as specified in Section 4.06.

No classification of excavated materials will be made unless otherwise indicated in the Contract Documents or provided for on the bid form. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the Work regardless of the type, character, composition, or condition thereof. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

Any part of the trench excavated below required trench grade shall be corrected with placement of additional bedding material by the Contractor at no cost to the Owner. Trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen. Trench bottoms that are otherwise solid but become mucky on top due to construction operations shall be reinforced with one or more layers of ³/₄" crushed stone as approved by the Engineer. Not more than ¹/₂-inch depth of mud or muck shall be allowed to

remain on (stabilized) trench bottoms when the pipe bedding material is placed thereon. The alignment and grade or elevation of the pipeline shall be as shown on the Drawings. The Contractor must maintain a constant check of the pipe alignment and trench depth (vertical pipe grade) and will be held responsible for any deviations there from. Unless otherwise shown or indicated on the Drawings or unless otherwise set forth by the Engineer, the horizontal and vertical alignment of the water main shall be maintained to within the following tolerances: <u>Horizontal</u> 3 inches; <u>Vertical</u> 1.5 inches.

Except where otherwise shown, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe and as required in the Project Documents. Greater pipe cover depths may be necessary on existing pipe, conduits, drains, drainage structures, or other obstruction encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finish grade or bottom of pavement.

The trench in earth shall have a flat bottom the full width of the trench and shall be excavated to the grade to which the pipe is to be laid as show on the Drawings. The surface of pipe bedding shall be graded to provide a uniform bearing and continuous support for each pipe at every point along its entire length.

Unless shown otherwise on the Drawings or noted in the Special Provisions, no rock exploration has been made. On those projects where rock exploration has been made, test holes have been drilled at locations and intervals as shown on the Drawings or a geotechnical report to determine soil types and depth of rock. Resistance to penetration was generally assumed to be "solid rock". This information is furnished for general reference purposes only. The Contractor must form his own opinion as to the character of materials which will be encountered from an inspection in the ground, from his own investigation of the test hole information, or from such other investigations, as he may desire.

All rock excavation shall be carried to a minimum of 6 inches below the bottom of the standard trench bottom. Bedding material shall be used to restore the trench bottom to the desired elevation and grade and to provide a uniform bearing and continuous support for the pipe along its entire length. Care shall be exercised to prevent any portion of the pipe from coming to bear on solid rock or boulders, and remove any rock or boulders from being placed (accidently or otherwise) within excavated trench to 2 feet above the pipe line.

D. <u>Limiting Trench Width</u>. Trenches shall be excavated to a width, which will provide adequate working space and pipe clearances for proper pipe installation, jointing and embedment. However, the limiting trench width below an elevation 6 inches above the top of the installed pipe shall be as described on City of Topeka's Standard Detail Drawings.

E. <u>Removal of Water</u>. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and groundwater entering excavations, trenches, or other parts of the work in accordance with Section 2.04 "Control of Ground & Surface Water".

All excavations for concrete structures or trenches which extend down to or below static groundwater elevations shall be dewatered by lowering and maintaining the groundwater surface beneath such excavations a distance of not less than 12 inches below the bottom of the excavation. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment. Ground water shall be controlled as specified in Section 2.04, Control of Ground Water & Surface Water. Trench stabilization shall be as specified in Section 2.05 "Stabilizing Trench Bottoms" and 2.06 "Stabilizing Structure Subgrade". Removal of water is subsidiary.

F. <u>Sheeting and Shoring</u>. Except where banks are cut back on a stable slope, excavation for structures and trenches shall be properly and substantially sheeted, braced, or shored as necessary in accordance with Section 2.03 "Sheeting and Bracing". Trench Shoring and bracing is subsidiary. Trench sheeting shall not be pulled unless pipe strength is sufficient to carry trench loads based on trench width or disturb the design pipe line grade/alignment to the back of sheeting. Sheeting may not be pulled after backfilling, unless so directed by the Engineer. Where trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner, which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed as pipe embedment is being completed.

G. <u>Bedding</u>. The Contractor shall not place bedding material until the excavation has reached the required sub-grade. Bedding for PVC, PVCO and FPVC pipe shall be per AWWA Manual M23 and bedding for DI pipe shall be per AWWA Manual M41. Bedding for pipe line materials shall be as specified. Bedding shall be placed and compacted as specified for Type 'A' Compaction or as shown on the Drawings. Furnishing and placing bedding material is subsidiary.

H. <u>Laying of Pipe Line Materials</u>. Every precaution shall be taken to prevent foreign material from entering the pipe line while materials are stored/stock-piled for use and while it is being placed. If the pipe laying crew cannot put the line into the trench without foreign material entering the pipe, the Engineer may require that the exposed end(s) of the pipe be enclosed in canvas bags configured with drawstrings so that the material cannot enter the exposed pipe. Pipe shall be placed in a flat bottom trench accurately graded and bedded to uniformly support the entire length of the barrel of the pipe with bell holes excavated for the joints.

At times when laying pipe is not in progress, the open ends of the pipe shall be closed or covered by use of watertight cap or plug secured in such manner that debris and/or water due to trenching or water line leakage, rainfall or infiltration cannot occur. The Contractor shall ensure that all pipe, fittings and valves shall be thoroughly cleaned of all foreign matter before installation and shall be kept clean until the pipe line is put into service. The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted. Such affected surfaces shall be wiped clean, and if necessary, wire brushed, and kept clean until jointing is completed.

Pipe shall not be laid in a wet trench. In the event surface or groundwater accumulates in the trench, the excavation shall be dewatered to permit the work to continue. At times when the pipe laying is not in progress and at the close of the days' work or for other reasons, such as rest breaks or meal periods, the open end(s) of the pipe shall be closed by watertight cap or plug secured so that no water from the trench may enter the pipe. Sufficient backfill

material shall also be placed over the pipe to prevent flotation.

If water accumulates in the trench, the watertight plug(s) shall remain in place until the trench is free of standing water and mud that may enter the pipe. Pipelines in place shall not be used for draining trenches. Dewatering of trenches is subsidiary.

Except where necessary for making connections with other lines, pipe shall be laid with the bells facing in the direction of progress. Except at closures, or when authorized by the Engineer, not more than two (2) lengths of pipe shall be in position ahead of each made-up joint. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective, damaged, or unsound pipe and appurtenances shall be rejected and marked as such and removed from the work site immediately.

For push on pipe, the spigot shall be inserted into the bell to the line on the spigot. The previously completed joints must be braced so the line does not become "stacked", "over belled", or inserted past the reference mark on the spigot for current or previously placed pipe(s). If the insertion mark is not visible after assembly, the joints shall be dissembled and re- done correctly. The gasket seat in the bell shall be wiped clean after which the gasket should be placed. A thick film of lubricant should be applied to the entire inner surface of the gasket and on the spigot end of the pipe. The lubricant and the gaskets shall be as recommended and supplied by the manufacturer of the pipe being used. The lubricant shall be odorless, tasteless, nontoxic, and suitable for use in potable water via NSF61 approval. Field-cut pipe shall be beveled by filing or by mechanical means to remove any sharp or rough edges that might otherwise damage the gasket.

Restrained joints and anchoring joints shall be installed in strict accordance with the pipe manufacturer's recommendations and this Section.

Alignment of pipe or runs intended to be straight shall be laid straight. For ductile iron pipe, changes in horizontal or vertical alignment may be achieved by deflection at the joints when so indicated on the Drawings. Joint deflection shall not exceed the values listed in AWWA C600 for push-on type joints and mechanical joints, respectively, or the pipe manufacturer's published limits. For PVC and PVCO pipe, changes in horizontal and vertical alignment may be achieved by longitudinal bending when so indicated on the Drawings. Longitudinal bending shall not result in a bending radius less than the minimum listed in AWWA C605 for gasket-joint pipe and fused-joint pipe, respectively. When gasket-joint pipe is bent, the Contractor shall block or brace the pipe joints to ensure bending the pipe does not result in joint offset that exceeds the manufacturer's published limits. Pipe shall be protected from lateral displacement by pipe embedment material when being placed as specified. Under no circumstances shall the pipe be laid in water, and no pipe shall be laid under unsuitable trench conditions.

I. <u>Tracer Wire</u>. Tracer wire shall be installed along all pipe and service lines and along all fire lines along the top 120-degee sector of each pipe line and on all service laterals to the meter (required to be connected with main line tracer wire). Tracer wire shall be taped to the top of the each pipe line at Not Greater Than (NGT) three (3) foot intervals to retain the wire over the central top area of the pipe.

Tracer wire shall be extended to the ground surface and terminated in a tracer box. Tracer boxes shall be installed at all fire hydrants located 12 inches from the barrel of the hydrant, and positioned 180 degrees from the 4.5-inch pumper nozzle. Tracer wire shall also be extended into pits/vaults and manholes with 2-foot pig-tail.

The Contractor shall prepare a continuity test on all tracer wire in the presence of the Engineer. If the tracer wire is found to be not continuous after testing, the Contractor shall repair or replace the failed segment of wire.

J. <u>Corrosion Protection Wrap</u>. The poly-wrap shall be wrapped as snugly as practicable without stretching or compromising wrap via soil/bedding compression or filling with bedding materials when backfilling trench. Any sections of wrap that are punctured or otherwise compromised in any manner during installation shall be either re-wrapped or the original wrap removed/discarded and new poly-wrap installed. The poly-wrap tubing on pipe line sections shall be folded in a reasonably snug manner along the pipe length and taped at NGT three (3) foot intervals along the pipe length, with end wrap overlaps of 1-foot at each end and with outer layer ends taped around the full circumference of pipe or valve or fitting or hydrant barrel NLT three (3) full turns with tape. See DIPRA's Corrosion Control Polyethylene Encasement document for installation guidance.

K. <u>Bedding and Cover</u>. Initial Bedding material shall be placed in finished excavated trench bottom as shown on the Drawings and in accordance with trench conditions. Bedding material shall be spread in a uniform manner to provide a consistent support for pipe and other accessories when placed. When the correct horizontal and vertical alignment is confirmed, additional bedding material shall be "sprinkled" or "loosely spread" over the pipe and accessories in a fashion to assure material filling the space along the pipe haunches and so as not to displace alignment until material covers the pipe as required. Bedding material shall not be "dumped" into the trench or directly onto the pipe.

L. <u>Fittings, Valves and Valve Boxes Installation</u>. Fittings, valves, valve boxes and air release valves shall be installed at the locations shown on the Drawings. All valves and fittings shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded, or rolled. Valves shall be stored at all times in a safe manner to prevent damage and kept free of dirt, mud, or other foreign matter. All valve gaskets shall be stored and placed in a cool location, out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis. Gate valves and fittings shall be set and joined to new pipe in the manner specified herein for the placement, and joining of pipe. All butterfly valves operators shall be oriented on the north or west side of the main.

Valves and valve boxes shall be firmly supported, centered, and plumbed over the operating nut of the valve, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box.

All connections requiring bolts shall be installed and tightened in strict accord with manufacturer's installation instructions. Nuts-bolts shall not be over tightened, but shall meet the recommended torque tightness in accordance with the manufacturer's installation instructions.

Chambers or pits containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer. Blow-offs, air relief valves, or combined air/vacuum relief valves shall not be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground.

M. <u>Anchoring and Blocking</u>. All bends, tees, crosses and plugs installed shall be provided with concrete blockings and/or restrained joint type connections in accordance to Drawings. In all cases concrete shall conform to the dimension and neat lines detailed on the Drawings and shall be placed directly against undisturbed trench wall opposing the thrust of the pipeline. The trench wall is to act as a form for the concrete. The edge of the block shall be vertical and shall be hand finished to a smooth, firm surface. If necessary for wall stabilization, the trench wall shall be given a "plaster" coat of cement mortar. No concrete or blocking shall be placed within 3 inches of the jointing area. All blocking shall have formed neat lines and smooth (troweled) surfaces.

Valves not spooled to fittings shall have a concrete thrust collar located on one side of the valve as shown on the Drawings. All in-line valves greater than 12 inches and any end of line valves shall be restrained to thrust collar pipe.

No concrete shall be placed until excavation has been approved by the Engineer. Should over- excavation occur, the Contractor shall fill the over-excavated areas with concrete at their sole expense. All steel clamps, tie rods, anchor bolts and other structural or anchorage shapes used in anchors and blocking, but not encased in concrete, shall be stainless steel 304 or 316.

Concrete blocking shall not be backfilled over until 75% of the design compressive strength is attained based upon cylinder breaks or until the concrete has cured for 7 days.

If the blocking contains 1% calcium chloride, the pressure testing can begin 8 hours after the block has been poured.

N. <u>Tapping Sleeves and Valves</u>. Where shown on the Drawings, the Contractor shall furnish and install the tapping sleeves and valves. The Water Division will make the actual wet tap and test the installation for leaks. After the tap is complete, the Contractor shall complete the piping connections and set the valve box and cover.

O. <u>Fire Hydrants</u>. Hydrants shall be installed at locations shown on the Drawings or as directed by Engineer, and shall include all necessary excavation, bedding, blocking and backfill to make the installation complete. If hydrant location is in a traffic area, it shall be protected by curb and gutter with a minimum of 3 feet radius from center of hydrant or a method approved by Engineer. Each hydrant shall be inspected before installation for direction of opening, nozzle sizes, threading, caps & chains, operating nut, tightness of pressure- containing bolting, cleanliness of inlet elbow and weep-hole openings and handling damage or cracks/chips. Defective hydrants shall be corrected or replaced timely.

Hydrants shall be set to a grade that allows their proper operation, and installed plumb and true. The weep holes of the hydrant shall be kept clear and free to drain. Traffic hydrants will be set with the break-away joint above the finished grade line. Hydrants behind curbs shall be placed with the hydrant centerline at least 36 inches from back-of-curb. The areas around each hydrant (and branch valve in turf/gravel) shall be thoroughly compacted to

prevent settlement of these areas.

The Contractor shall "black bag" hydrant until operational and rotate the hydrant pumper nozzle for proper orientation, pumping nozzle facing adjacent curb unless directed otherwise, following the system becoming operational. Temporary hydrants shall be cleaned and delivered to the Owner in sound condition and proper working order, with all normal components.

P. <u>Backfill and Compaction</u>. The Contractor shall not backfill over pipes before the Engineer approves pipes as being set on line/grade and properly joined. Backfill and compaction shall be completed as specified in Section 2.09 "Compaction" and 2.10 "Backfill". Backfill and compaction are subsidiary.

Q. <u>Connection to Existing Mains</u>. Water shall not be allowed to flow from the new pipe line into existing pipe lines until the new line has been thoroughly flushed, disinfected, tested and approved by the Engineer. Subsequent to approval, the Water Division will close the necessary valves and the Contractor shall make the connections at the locations shown on the Drawings using the types of fittings and lengths of straight pipe called-for or as may be required by field conditions. The Contractor shall excavate the main(s) to provide a safe working area of sufficient size for pipe removal and installation of new fitting(s), valve(s) and straight pipe.

The excavation shall extend below the pipeline to be removed to provide a minimum working space adequate to allow for pipe cutting, installation of fittings/valves, and collection/pumping of released water. For system interconnects, the Contractor should place a 4 inch thick concrete 'working slab' a minimum of 2.5 feet below the new fitting(s) and valve(s) to be installed. This 'working slab' is to provide temporary support of the new and existing piping/fittings until final blocking, bedding and backfilling can be completed and will be considered subsidiary.

It may become necessary to test the new pipeline in segments, omitting the required testing of some connections with existing pipelines as specified for new construction. In either case, the methods of testing and disinfection shall be approved by the Engineer. This work shall be subsidiary.

The Contractor shall employ the services of a mechanical contractor to air out any reconnected fire service or service line (4-inch diameter and larger) or make arrangements with the customer upon completion of the connection to the new main so that the customers personnel may air out the service. The fire line backflow device shall be tested and reported as required. The mechanical contractor shall be duly experienced, licensed and permitted for this work. The cost of this work shall be subsidiary to the water line installation.

Connection to existing mains shall be so scheduled and timed as to cause the least possible interference with the operation of existing mains and service to existing customers, as approved by the Engineer.

R. <u>Temporary Blow-Off Assemblies</u>. Temporary blow off assemblies shall be constructed at the locations shown on the Drawings and in the manner indicated in the Contract Documents or as directed by the Engineer as necessary to pressure test and disinfect water pipes. Construction shall be as per the manufacturer's recommendations or as specified in the Project Documents. Blow-offs shall discharge at a location designated by the Engineer. Hosing may be required to convey blow-off to the desired point of discharge.

S. <u>Conflicting Utilities</u>. The Contractor shall excavate the utilities that are to be crossed by pot-holing a minimum distance of 150 feet in advance of the work-in-progress to allow the Engineer sufficient time to check the grades and to communicate with the owner(s) of those utilities reasonable time to relocate such conflicts, should that become necessary. Any delay resulting from the required relocation of a conflicting utility crossing or their appurtenances will not be grounds for additional payment to the Contractor.

T. <u>Pavement Replacement</u>. Unless otherwise indicated in the Project Documents, the Contractor shall replace pavement as specified in Subsection 4.06, Pavement Removement/Replacement.

U. <u>Surface Restoration</u>. In areas where turf is the required restoration, the top portion of the backfill beneath established finish grades shall be finished with not-less-than four inches of compacted viable topsoil, and shall be topsoil salvaged during the excavation and trenching operation whenever practicable and as directed by the Engineer. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by disking or scarifying to a depth of two inches to permit 'bonding' of the topsoil to the underlying soil surface.

Areas designated with "topsoil and seeding" shall have topsoil pulverized and smoothed, fertilized, seeded, rolled to press seed into soil and mulched. Areas designated to be "sodded" shall have topsoil pulverized and smoothed, designated variety of sod grass placed with tight joints and staked, followed by rolling of entire area to smooth, level and compact the sod and topsoil layers.

V. <u>Stream Crossings</u>. Stream crossings shall be made in accordance with these Specifications and as shown on the Drawings. The trench width shall be as required for proper pipe installation and the trench depth shall be sufficient for a minimum of 7 feet of cover over the top of pipe beneath a navigable or unnavigable streambed. Pipe encasement, where required, shall be in accordance with the Specifications and placed as indicated on the Drawings. All work performed and all operations of the Contractor, their employees, or his subcontractors within the limits of stream crossing shall be in conformity with all the requirements, regulations and be under the control (through the Engineer) of the authority owning or having jurisdiction over and control of the right-of-way.

Where the pipe is to be installed inside a casing pipe or tunnel liner, polyethylene casing spacers shall be strapped to each pipe before it is placed in the casing pipe or tunnel liner in accordance with these Specifications and as shown on the Drawings. The ends of each casing pipe or tunnel liner shall be closed with a single piece pull over neoprene rubber end seal with a minimum thickness of 1/8-inch with stainless steel bands or as shown on the Drawings. The closures for each casing pipe or tunnel line shall not be constructed until all testing of the line has been completed and accepted.

W. <u>Highway and Railroad Crossings</u>. The Contractor shall make highway and railroad crossing in accordance with these Specifications, the Special Provisions and as shown on the Drawings. All work performed and all operations of the Contractor, their employees, or their subcontractors within the limits of highway or railroad rights-of-way shall be in conformity with all the requirements, regulations and be under the control (through the Engineer) of the authority owning or having jurisdiction over and control of the right-of-way.

Where the pipe is to be installed inside a casing pipe or tunnel liner, polyethylene casing spacers shall be strapped to each pipe before it is placed in the casing pipe or tunnel liner in accordance with these Specifications and as shown on the Drawings. The ends of each casing pipe or tunnel liner shall be closed with a single piece pull over neoprene rubber end seal with a minimum thickness of 1/8-inch with stainless steel bands or as shown on the Drawings. The closures for each casing pipe or tunnel line shall not be constructed until all testing of the line has been completed and accepted. The work shall be performed in accordance with Subsection 2.12, "Tunneling and Boring".

X. <u>Water Services</u>.

(1) <u>Service Connection Taps</u>. The Contractor shall furnish/install saddle and corp; Water Division will make the actual wet tap. After the tap is complete, the Contractor shall complete the piping connections and set the meter setter, box and cover.

(2) <u>Service Connection Pipe: 1", 1.5" and 2"</u>. Piping shall be P.C. 305 rated and CTS OD and be continuous from main to meter box with no intermediate couplings, unless approved by the Engineer. Polyethylene water service line must be laid with tracer wire using metal inserts with all fittings. NOTE that 3" PE or other type water service lines from main-to-meter shall not be permitted.

(3) <u>Service Connection Pipe: 4" and larger</u>. Pipe installation shall conform with mainline pipe of corresponding sizes and materials. All Service Pipe shall be laid with Tracer wire.

8.04 ABANDONMENT / SALVAGE OF UNUSED WATER MAINS - SERVICES:

A. <u>Abandonment Requirements</u>. All existing water mains, appurtenances or service lines that will not be re-used in the new construction, or re-used for reconstruction of existing building sites shall be abandoned in a manner pre-approved by the Engineer. All water main appurtenances (valves, hydrants, etc.) shall be abandoned by removal of subject appurtenances and installing a plug or cap, as appropriate, using type 304/316 SS bolts and nuts (Teflon coated).

Main, appurtenance and/or service abandonment at the street main shall be a condition of any site demolition permit(s) issued or in the case of duplication, service lines that will remain unused on new or reconstruction. All water service lines 2-inch diameter and smaller shall be abandoned by turning off the corporation tap stop valve, disconnecting and removing 2 - 3 feet of service line, removing corp valve and installing a standard brass plug on saddle. The brass cap (and plug) shall be Ford copper tube nut with FIP on the small end and MIP nut (part # C01.xy and C08.ab) or as approved by the Engineer. The remaining service line may remain abandoned in place.

B. <u>Salvage Requirements</u>. The Contractor shall carefully remove and salvage valves, fittings or other designated waterline appurtenances and transport them to a location designated by the Engineer. Removal shall include any concrete blocks interfering with the removal of the designated item or interfering with intended extension or modification of the waterline. No extra payment shall be made for the removal and disposal of concrete or blocks.

Removal of valves, fitting or other appurtenances shall be accomplished by unbolting the valve or fitting, if possible. If corrosion prevents removal by unbolting, the item shall be removed by neatly cutting or sawing the existing water line or appurtenance as close to the item as possible. Where the existing line is to remain in service, removal shall be accomplished in such a manner that rejoining of the water line can be accomplished with as few joints and/or sleeves as possible. Where the existing waterline is to be abandoned in place, it shall be plugged with concrete or another suitable device to provide a permanent watertight seal.

Items to be salvaged and removed shall be lifted and handled with care and in no case shall be dropped, thrown, skidded or rolled. The Contractor shall clean salvaged items to be free of dirt and debris prior to delivery to the Owner.

8.05 PRESSURE TESTING AND LEAKAGE ALLOWED

A. <u>General</u>. After installation, all newly installed mains shall be flushed and pressure/leakage tested and disinfected by chlorination prior to final acceptance. All flushing work shall be done in the presence of the Engineer's Representative. The Contractor shall notify the Engineer at least 24 hours in advance of the times and places at which flushing work is to be done and how. Water Services Division personnel will operate all existing system valving and contractor installed valves that control flow of potable water, with the Contractor manipulating the new water main valve(s) and hydrant(s) to slowly fill the new main and remove/expel all air from the section of water line being tested. When hydrants are in the test section, the test shall be made against closed hydrant valve(s); any service or fire line(s) installed shall be tested to their terminus.

Pipe and accessories to be tested shall be filled slowly with potable water at a maximum velocity of 1.0 ft per second while venting air. After filling, lines shall be flushed at blow-offs and dead-ends at a minimum velocity of at least 2.5 feet per second in the pipeline to be tested. Flushing shall be carried out until turbidity-free (< 5 NTU or system ambient values) water is obtained from all points along the main. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity and pigging of the main may be required.

A minimum of one (1) change (up to three changes without charge to Contractor for water volume usage) of treated water shall be used in the flushing operations. A special pipeline pig may be required when the required flushing velocity cannot be achieved or when needed to conserve water during water use restriction period or to remove caked deposits or to prevent erosion damage, nuisance or traffic interruption, as directed by the Engineer. The Contractor shall make provisions for launching and retrieving the pig at no additional charge or cost to Owner.

Valves shall be closed slowly to prevent excessive surges while maintaining positive pressure at all times throughout the pipeline section being tested. Flushing water shall be discharged without causing erosion damage, nuisance or interruption of traffic. Flushed water will be tested for Total Chlorine Residual, and if greater than 0.5 mg/L, then discharged water shall be de-chlorinated by the Contractor using Engineer approved method(s) as provided herein.

The Contractor shall provide the pressure gauges reading from 0 - 200 psig with intervals not exceeding 5 psi, measuring meter capable of reading to nearest 0.10 gallon increments, injection booster pump, pipe/hoses, connections and other necessary apparatus and the necessary labor to conduct the test. Prior to filling the pipeline test section(s) and prior to performing the actual test, the Contractor shall place sufficient backfill and thrust blocking or other types of restraining systems to prevent pipe movement, but before placement of final surfacing.

When existing water mains are used to supply test water, they should be protected from backflow contamination. Tests shall be performed only after the pipeline test section(s) have been properly filled, flushed and purged of air. After flushing and when hydrants are in the pressure test section, the test shall be made against the closed hydrant valve.
The specified test pressure shall be applied by means of an approved pumping assembly connected to the pipeline in manner approved by Engineer. The test pressure shall not exceed the design pressure of the pipe, fittings, valves and hydrants and thrust restraints as herein provided. During tests, the system and exposed pipe, fittings, valves and hydrants shall be carefully inspected for leakage; visible leaks shall be stopped and defective elements shall be repaired of removed/replaced and the test repeated until the pressure test requirements have been met.

The Contractor shall perform hydrostatic test (pre-test) of the test segment at the specified test pressure(s). The pre-test shall continue until the Contractor has satisfied himself that the test segment will pass the hydrostatic test. In general, pressure and leakage testing shall conform to applicable sections of AWWA C600 and C605 and as required herein.

B. <u>Test Duration</u>. The duration of the final hydrostatic test shall be a minimum of two hours at the required pressures for the test section. The pipeline shall be allowed to stabilize at the test pressure before conducting the hydrostatic test. This may require several cycles of pressurizing and bleeding trapped air prior to beginning the final test.

C. <u>Test Pressure</u>. The test pressure shall be no less than 150 psig for PVC, PVCO, FPVC, and DIP pipelines. The hydrostatic test pressure shall not be less than 1.25 times the stated sustained working pressure at the highest elevation along the test section, and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section. In the event that the lowest and highest elevations of the section being tested exceeds 58.0 feet, the pipeline section to be pressure tested shall be reduced in length such that the segment to be tested conforms with the foregoing criteria and pressure requirements.

The hydrostatic test pressure shall not vary by more than ± -5.0 psig for the duration of the test period. The test pressure shall be maintained within this tolerance by adding make-up water through the metered pressure test pump into the pipeline test segment. All make-up water added shall be accurately measured in gallons (and fractions thereof) by suitable methods. The total make-up water added during and at the conclusion of the test period to reach the <u>required</u> test pressure shall not exceed the calculated leakage allowance for the pipeline segment being hydrostatically being tested.

D. <u>Testing Allowance; Leakage</u>. No pipe installation will be acceptable if the leakage is greater than that determined by the following formulas for: PVC, PVCO, FPVC or DIP. When multiple pipe sizes are concurrently being tested, the allowable leakage shall be calculated based on the sum of leakages determined for each size of the tested segment. No pipe installation will be acceptable if the actual measured leakage is greater than that determined by following formula.

$$\begin{array}{l} L \ x \ D \ x \ P^{0.5} \\ Q = \frac{1}{48,000} \\ \text{where,} \\ Q = \text{allowable leakage, in gallons per hour} \\ L = \text{length of pipe tested (by size), in feet} \\ D = \text{nominal diameter of the pipe, in inches} \\ P = \text{average test pressure during the leakage test, based upon high and} \\ \text{low points within the segment size tested, in pounds per square inch} \end{array}$$

The above equation is based on a leakage rate of 10.5 gallons per day per mile per inch of nominal diameter of pipe. Leakage values determined by the above formula for 1000 feet of pipe are presented in, AWWA C600 and AWWA C605.

During the test(s), the new system and exposed pipe, fittings, valves, and hydrants shall be carefully examined for leakage. Visible leaks shall be stopped. Defective elements shall be repaired or removed and replaced and the test repeated until the test requirements have been met.

A swift loss of water pressure in the main could be the result of a break in the line, major valve opening, loose mechanical joint bolts, missing or dislodged gasket, or inadequate thrust block. A slow loss of pressure in excess of allowable limits could be the result of minor problems such as a leaking valve or a corporation stop not completely shut off. In addition, air entrapped in the line can result in an apparent leakage in excess of the allowable limit.

Recommendations for avoiding minor leaks include the following:

- Vent all high points in the line by use of air release valves, corporation stops or hydrants.
- Check all mechanical joint bolted connections.
- Cure concrete thrust blocks before testing.
- Ensure that exposed gasket grooves are properly cleaned before inserting gaskets.
- When inserting pipe into a mechanical joint or gasket joint, insure that the spigot end is squarely cut and beveled properly for the hub.

One approach for determining if the apparent leakage is the result of air entrapped in a line is to immediately repeat the leakage test (i.e., continue the test for another two hours) and determine the amount of make-up water required to fill the line a second time. If this amount is significantly less than the first filling, the difference in apparent leakage is probably the result of air being present in the line. If no significant difference in make-up water is recorded, a leak is probable.

8.06 DISINFECTION OF PIPELINE

A. <u>General</u>. While bacteriological testing in accordance with this subsection is used to verify that absence of coliform organisms and is generally accepted as verification that disinfection of the pipeline has been accomplished, coupled with adequate flushing of the line before disinfection, is necessary to ensure that the disinfected pipeline will be ready for connection to the water system. Failure to pass the bacteriological test requires that the flushing or disinfection process be repeated by the Contractor. It must be remembered that the final water quality test is not the primary means for certifying the sanitary condition of a main. The sanitary handling of materials, the practices during construction, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main.

Of the three methods described in ANSI/AWWA C651, only one method will generally be described herein for use: the continuous feed method. Of the three forms of chlorine that may be used in the disinfection operations, only two (2) forms will be acceptable for use: sodium hypochlorite solution and calcium hypochlorite granules mixed into solution conforming to ANSI/AWWA B300.

Sodium Hypochlorite Solution contains between (+/-) 5 % and 15 % available chlorine and the storage conditions and time (age) must be controlled to minimize its deterioration. Available chlorine refers to the amount of chlorine equivalent to hypochlorite in terms of oxidizing power. It is a measure of strength and bleaching power and, in one or another of its related units of measurement, denotes the concentration of the bleach solution.

Trade percent available chlorine = $\frac{\text{gpl available chlorine}}{10}$ (Eq 1, AWWA B300 II.B)

Calcium Hypochlorite is available in granular form and must contain about 65 % available chlorine by Weight. Prior to use, the material should be stored in a cool, dry and dark environment to minimize its deterioration. Note: Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate from the pipe after the desired contact time has been achieved.

B. <u>Basic Disinfection Procedure</u>. The basic disinfection procedure consists of multiple steps and procedures to ensure successful disinfection of the pipeline.

- (1) Inspecting materials delivered to the work site and at the time of installation to ensure their integrity.
- (2) Preventing contaminating materials from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.
- (3) Removing by flushing minimum 2.5 ft/sec or other means as necessary, those materials that may have entered the water main or accessories.
- (4) Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main.

- (5) Protecting the existing distribution system from backflow caused by hydrostatic pressure test and/or disinfection procedures.
- (6) Documenting that an adequate level of chlorine contacted each pipe and accessory to provide disinfection.
- (7) Determining the bacteriological quality by laboratory test after disinfection procedures.
- (8) Final connection of the approved new water main to the active distribution system.

The continuous feed method consists of mixing the Hypochlorite granules into a concentrated mixture to create a strong chlorine concentrated solution and feeding the solution into the pipeline to achieve an initial free chlorine concentration throughout the pipeline. The potable water and chlorine solution shall result in the entire pipeline and components being disinfected with a free chlorine residual of not less than 25 mg/L after a 24 hour holding period.

At a point not more than ten feet downstream from the beginning of the new main, water entering the main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50 mg/L initial free chlorine in the pipeline. To ensure that this concentration is provided, measure the chlorine concentration at regular intervals in accordance with the procedures described in the current edition of Standard Methods for the Examination of Water and Wastewater, or AWWA Manual M12, or using appropriate Serim Monitor for Chlorine free chlorine test strips as manufactured by *www.SanitationTools.com*. Solutions of 1 percent free chlorine may be prepared with either type hypochlorite granule. For Calcium Hypochlorite solution requires one 10 lbs. of granule in 8 gallons of water.

Chlorine application shall not cease until the entire main and all included accessories are filled with heavily chlorinated water. The chlorinated water shall remain in the main for at least 24 hours, during which time valves, hydrants and service lines in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this contact period, the treated water in all portions of the main shall have a residual of not less than 25 mg/L of free chlorine.

C. <u>Final Flushing</u>. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself and appurtenances, the heavily chlorinated water shall be flushed from the main, fittings, valves, and all branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, the Contractor shall use a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine. State or local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water. Chlorine residual of water being disposed shall be neutralized by treating with Ascorbic Acid. Periodic grab samples shall be taken after a travel distance of about 250 to 300 feet from the de-chlorination chemical addition point with chlorine residual being measured. De-chlorination chemical addition will be adjusted to achieve a chlorine residual of not more than 0.2 mg/L.

D. <u>Bacteriological Samples and Testing</u>. In conformance with Option B of AWWA C651, section 5.1.1.1, after the flushing and disinfection procedures have been accomplished, representative samples will be collected for each increment of 1200 feet or portion thereof and from the beginning and from the end of the line and on all branch lines by trained Water Division personnel. Sample(s) shall be analyzed promptly following collection by a State recognized water testing laboratory for: chlorine residual, Turbidity, pH and a standard heterotrophic plate count (HPC) test, including coliforms. Unless otherwise provided, the Water Treatment Plant Laboratory will perform bacteriological analyses of the first and second series of samples on each test segment without charge. A record or report of the bacteriological test results for each sample tested shall be provided to the Contractor and to Engineer's Representative for the Owner's project record files.

If sample results from the lab indicate a measured HPC greater than 500 colony-forming units per milliliter (cfu/ml), flushing should be resumed and another series of bacteriological samples collected and analyzed until no coliforms are present and the HPC is less than 500 cfu/ml. If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the main test segment may be re-flushed and shall be re-sampled. If check samples also fail to produce acceptable results, the main test segment shall be re-chlorinated by the continuous feed method until satisfactory bacteriological results are obtained.

All additional flushing and/or disinfecting and for bacteriological sampling and analyses costs over and above a second series may be back-charged to the Contractor, including Engineer's Representative time.

E. <u>Final Connections to Existing Mains</u>. All water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological results received prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection(s) so that there is no contamination of the new or existing water main with foreign material or trench /ground water.

Connections shall have all pipe, fittings and valves required for the connection sprayed with a minimum one to five (1 - 5) percent solution of chlorine just prior to being installed. During the time that the connection piping awaiting installation and after the spraying procedure, the ends of the piping must be covered with plastic wrap, watertight plug(s), cap(s) or means acceptable to Engineer.

8.07 SEPARATION OF WATER MAINS AND OTHER POLLUTION SOURCES

The Contractor shall notify the Engineer in accordance with requirements of the Kansas Department of Health and Environment (KDHE), if, during the performance of the work, the Contractor encounters or uncovers a known or unknown source of pollution. The Engineer will inspect the known or suspected point of pollution and advise the Contractor as to what course of action shall be taken prior to continuation of the installation of the water main or appurtenances.

A minimum horizontal distance of 10 feet shall be maintained between the barrel OD of new main and any sanitary or combined sewer, sanitary or combined sewer manhole. When the new water main or appurtenance crosses below the sanitary sewer or is within two feet above the sanitary sewer, the sewer shall be encased in concrete or constructed of ductile iron pipe conforming to ASTM A536 or AWWA C151, minimum thickness class 50 with gasketed, push-on or mechanical joints conforming to AWWA/ANSI C110/A21.1 OR AWWA/ANSI C111/A21.11 or PVC conforming to ASTM D3034 with minimum wall thickness SDR 26, ASTM F679, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212 or as detailed on the Drawings.

For pressure sewer lines there shall be at least 2 feet vertical separation at crossings with the water mains always crossing above sewer force main. Where it is not practical to maintain the horizontal or vertical separation between the water main and the sanitary force main, an equivalent protection method may be substituted on a case by case basis if supported by data and consultation from the design engineer and KDHE.

A minimum distance of 25 feet shall be maintained between all potable waterlines and all pollution sources, e.g., septic tanks, septic tank absorption fields, waste stabilization ponds, sewage contamination, wastewater, landfill leachate, and all CAFO facilities. Under no circumstances shall a waterline be extended through an area that is a real or potential source of contamination to the water line or water supply. Under no conditions shall the encasement of a water line be considered as adequate protection of a water line or a water supply for the purpose of extending the water line through a real or potential source of contamination.

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Concrete Pavement Details	DT-002	03-2013
Curb & Gutter and Approach Details	DT-003	03-2013
Ramp & Walk Details	DT-004	05-2016
Standard Manhole Details	DT-005	03-2013
Manhole Rehabilitation Details	DT-006	02-2008
Sanitary Sewer Details	DT-007	03-2013
Storm Sewer Details	DT-008	03-2013
Type I Inlets	DT-009	03-2013
Type I-P Inlets	DT-010	03-2013
Type II-P Inlets	DT-011	12-2009
Ditch Inlets	DT-012	02-2008
Type II-P Area Inlet Manhole	DT-013	02-2008
Channel Linings	DT-014	02-2008
Pipe Outfalls	DT-015	02-2008
Wash Check, Trickle Channel & Flume	DT-016	02-2008
Miscellaneous Details I	DT-017	03-2013
Miscellaneous Details II	DT-018	12-2012
Typical Project Signing	DT-019	03-2013
Erosion & Pollution Control - Inlet Protection & General	Notes DT-020	07-2018
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Wiring, Timing & Street Name Signs	DT-100	10-2017
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Traffic Control	DT-118	02-2012
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Traffic Control	DT-121	01-2012
(located in Traffic Engineering Section)		
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CONTACT LIST

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Construction Management Section	Ph. 368-3842 Fax 368-3881
Survey Section	Ph. 368-3842 Fax 368-3881
Development Services Office/ Permit Office	Ph. 368-3704 Fax 368-1650
CITY OF TOPEKA WATER AND WATER POLLUTION C	CONTROL DIVISION
One-Call Center	Ph. 368-3111
Utility Management Services	Ph. 368-0973 Fax 368-3146
SHAWNEE COUNTY PUBLIC WORKS DEPARTMENT	
Administrative/General Information	Ph. 251-6101 Fax 251-4920
Building Permits	Ph. 291-5410 Fax 291-4939



U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Painting, Marking, and Lighting of	Date: April 1, 2010	AC No: AC 150/5210-5D
Vehicles Used on an Airport	Initiated by: AAS-100	Change:

1. PURPOSE. This advisory circular (AC) provides guidance, specifications, and standards for painting, marking, and lighting of vehicles operating in the airport air operations area (AOA). The approved lights, colors, and markings herein assure the conspicuity of vehicles operating in the AOA from both the ground and the air.

2. CANCELLATION. This AC cancels AC 150/5210-5C, Painting, Marking, and Lighting of Vehicles Used on an Airport, dated August 31, 2007.

3. APPLICATION. The Federal Aviation Administration (FAA) recommends the guidelines and standards in this Advisory Circular for vehicles operating in the airport AOA. In general, use of this AC is not mandatory. *However*, use of this AC is mandatory for vehicles funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assurance No. 34, "Policies, Standards, and Specifications," and PFC Assurance No. 9, "Standard and Specifications."

Vehicles covered by this AC that do not meet this standard may be used until the vehicle is repainted or replaced, but no later than **December 31, 2010.**

4. **PRINCIPAL CHANGES.** This AC contains new specifications and recommendations for the painting, marking, and lighting of Towbarless Tow Vehicles (TLTVs).

5. METRIC UNITS. To promote an orderly transition to metric units, this AC includes both English and metric dimensions. The metric conversions may not be exact equivalents, and until there is an official changeover to the metric system, the English dimensions will govern.

6. **COMMENTS OR SUGGESTIONS** for improvements to this AC should be sent to:

Manager, Airport Engineering Division Federal Aviation Administration ATTN: AAS-100 800 Independence Avenue, S.W. Washington, DC 20591

Michael J. O'Donnell Director of Airport Safety and Standards

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PAINTING, MARKING, AND LIGHTING OF VEHICLES USED ON AN AIRPORT

1. SOURCES OF APPLICABLE DOCUMENTS.

a. American National Standards Institute, Inc. (ANSI), 25 West 43rd St. 4th Floor, New York, NY 10036. Website: **www.ansi.org**

b. American Society for Testing & Materials (ASTM), ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Website: **www.astm.org**

c. The National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, Massachusetts 02169-7471. Website: **www.nfpa.org**

d. The U. S. General Services Administration (GSA), Centralized Mailing List Services, 501 West Felix Street, Whse 9, South End P.O. Box 6477, Fort Worth, Texas 76115-6477. Website: **www.gsa.gov**

e. The Superintendent of Documents, U.S. Government Printing Office, 732 North Capitol St. NW, Washington, DC 20401.

f. Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001. Website: **www.sae.org**

g. FAA Advisory Circulars: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Ave., Landover, MD 20785. Website: **www.faa.gov**

h. FAA Engineering Briefs: www.faa.gov/airports/engineering/engineering_briefs/

2. **DEFINITIONS.** The following definitions apply in this AC:

a. Vehicle – All conveyances, except aircraft, used on the ground to transport persons, cargo, equipment or those required to perform maintenance, construction, service, and security duties.

b. Air Operations Area (AOA) – The portion of airport that encompasses the landing, take off, taxiing, and parking areas for aircraft.

c. Airport Emergency Vehicles – Vehicles that are authorized in the AOA for emergency purposes (e.g., ambulances, aircraft rescue and fire fighting (ARFF) vehicles and emergency response vehicles) as authorized by the airport traffic control tower (ATCT) or an authorized onsite accident/incident commander.

d. Airport Operations Vehicles – Vehicles routinely used by airport operations personnel for airport inspection and duties associated with airfield operations (such as airfield condition reporting and Incident Command) on the AOA and Movement Area.

e. Airport Security Vehicles – Vehicles that are authorized in the AOA for security purposes, as needed (e.g. police cars).

f. Airfield Service Vehicles – Vehicles that are routinely used in the AOA for airfield service, maintenance, or construction (e.g. snow blowers, snowplows, maintenance trucks, and tractors).

g. Aircraft Support Vehicles – Vehicles that are routinely used in the AOA to support aircraft operations (e.g. aircraft pushback tractors, baggage/cargo tractors or trucks, air conditioning and aviation fuel trucks). These vehicles are typically owned by airlines, vendors, or contractors and are not eligible for Federal funding.

h. Reduced Visibility – Prevailing visibility is less than one statute mile (1609 meters) and/or the runway visual range (RVR) is less than 6,000 feet (1830 meters).

i. Movement Area – The runways, taxiways, and other areas of an airport/heliport that are used for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with an operating airport traffic control tower (ATCT), specific approval for entry onto the movement area must be obtained from air traffic control (ATC).

j. Other Vehicles – Vehicles that are not routinely authorized in the AOA (e.g. construction vehicles). These vehicles are typically owned by airlines, vendors, or contractors and are not eligible for Federal funding.

k. Peak Intensity – Peak intensity, for purposes of this document, means the maximum magnitude of luminescence as measured in candela.

I. Towbarless Tow Vehicle (TLTV) – a type of aircraft support vehicle whose main purpose is to tow aircraft in the AOA by way of nose gear capture.

3. VEHICLE PAINTING.

NOTE: Airport vehicle paint and markings are a safety of flight requirement. The approved colors/markings herein assure conspicuity of vehicles operating in the AOA from both the ground and air.

a. Airport Emergency Vehicles.

(1) Ambulances. Ambulance vehicles are painted per the most current version of Federal Specification KKK-A-1822, *Federal Specification for the Star-of-Life Ambulance*. Ambulances are not considered vehicles routinely operating on the AOA.

(2) Aircraft Rescue and Fire Fighting (ARFF) Vehicles. Yellowish-green is the vehicle color standard. Color specifications are per Appendix A.

NOTE: A yellowish-green color provides optimum visibility during all light levels encountered during a 24-hour day and under variations of light that result from weather and seasonal changes.

b. Airport Operations Vehicles. Airport operations vehicles may be painted in colors designated by the airport operator. The characteristics must be coordinated with the respective ATCT and identified in the tower letter of agreement.

c. Airport Security Vehicles. Comply with specific state or local requirements.

d. Airfield Service Vehicles. Chrome yellow is the vehicle color standard. Color specifications are per Appendix A. When vehicles are equipped with bumper bars 8 inches (200 mm) or more in depth, the bars must be painted in alternate stripes 4 inches (100 mm) in width of chrome yellow and black inclined 45° to the vertical.

e. Aircraft Support Vehicles.

(1) Any color or combination of colors other than yellowish-green or chrome yellow. The bumper bar paint scheme in paragraph 3.d (of alternating chrome yellow and black stripe) is recommended.

(2) TLTVs. International orange is the vehicle color standard. Retroreflective tape covering more than 25 percent of the vehicle's vertical surfaces may be used as a temporary measure to meet this standard prior to scheduled vehicle painting.

f. Other Vehicles. Any color or combination of colors other than solid black or white.

4. VEHICLE MARKING.

a. Airport Emergency Vehicles.

(1) **Ambulances.** Ambulances are marked per the most current version of Federal Specification KKK-A-1822.

(2) **ARFF Vehicles.** Emergency rescue and fire fighting vehicles are marked with the letters "ARFF, "Fire," or "Rescue" and in accordance with 4.c.(1)-(5) of this AC.

b. Airport Operations Vehicles. Airport operations vehicles may be marked as designated by the airport operator. Marking must be coordinated with the respective ATCT and identified in the tower letter of agreement.

c. Airfield Service Vehicles and Aircraft Support Vehicles.

(1) Airport operator owned vehicles must display an identification number on each side and on the roof (the hood should be used if the vehicle has no roof).

(2) Side numbers will be a minimum of 16 inches (410 mm) in height and conspicuously located.

(3) Roof numbers will be a minimum of 24 inches (610 mm) in height and affixed with their bases toward the front of the vehicle. The identification numbers should provide sharp color contrast to the vehicle color.

(4) In addition to the identification numbers, airport operator-owned vehicles must display either the name of the airport and/or the airport insignia.

(5) To further improve night-time recognition of vehicles, a minimum 8 inch (200 mm) wide horizontal band of high gloss white paint or white reflective tape (Retroreflective, ASTM-D 4956-09, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Type III & above) must be used around the vehicle's surface. Figures 1, 2, and 3 show suggested locations for the horizontal reflective band.



Figure 1: Suggested location for the horizontal reflective band, Option 1



Figure 2: Suggested location for the horizontal reflective band, Option 2



Figure 3: Suggested location for the horizontal reflective band, Option 3

(6) **TLTVs.** Retroreflective tape is used to outline the shape of a TLTV. If the vertical edge of the vehicle is rounded, the tape should be placed on the rounded portion to reflect light in both the horizontal and vertical planes. Where the placement of the tape may interfere with, or may be worn down by, maintenance or operational activities, tape is not required. Suggested locations for the retroreflective bands are shown in Figure 4.



Figure 4: Suggested placement of retroreflective tape on a TLTV

d. Airport Security and Other Vehicles.

(1) Vehicles other than those that routinely traverse any portion of the AOA under the control of ATC, which are not escorted by a vehicle in constant two-way radio communication with ATC and properly equipped and authorized to operate in the AOA, must be provided with a flag on a staff attached to the vehicle so that the flag will be readily visible.

(2) At airports without air traffic control facilities, flags must be provided on all vehicles.

(3) The flag must be at least a 3-foot by 3-foot (0.9 meter by 0.9 meter) square having a checkered pattern of international orange and white squares at least 1 foot (300 mm) on each side (see Appendix A for the fabric color specification).

5. VEHICLE LIGHTING.

a. Airfield Service, Aircraft Support, and Airport Operations Vehicles.

(1) The standard for identification lighting is a yellow flashing light that is mounted on the uppermost part of the vehicle structure. A steady yellow light designates vehicles limited to non-movement areas.

(2) The light must be visible from any direction, day and night, including from the air.

(3) Color specifications for vehicle identification lights are per Appendix B.

(4) **TLTVs.** An LED light bar placed above the operator's cab may be used in place of the rotating yellow flashing light. In addition, a yellow flashing light (of any type) must be installed on the upper left-rear and right-rear corners of the TLTV, and must be activated when an aircraft is in tow. The size of the rear flashing lights must be large enough to meet the requirements of Section 5.c, but not so large as to interfere with the normal or towing operations of the TLTV.

b. Airport Emergency, Security, and Other Vehicles, which are not escorted by a properly lighted vehicle, must be identified during periods of low visibility by a light.

c. Characteristics of Flashing Lights:

(1) Ambulance lights must meet the specifications in the most current version of Federal Specification KKK-A-1822, and ARFF vehicles must meet NFPA, state, and local requirements.

(2) Lights must have peak intensity within the range of 40 to 400 candelas (effective) from 0° (horizontal) up to 10° above the horizontal and for 360° horizontally. The upper limit of 400 candelas (effective) is necessary to avoid damage to night vision.

(3) From 10° to 15° above the horizontal plane, the light output must be $1/10^{\text{th}}$ of peak intensity or between 4 and 40 candelas (effective).

(4) Lights must flash at 75 ± 15 flashes per minute.

NOTES:

1. The effective intensity of a flashing light is equal to the intensity of a steady-burning (fixed) light of the same color that produces the same visual range under identical conditions of observation.

2. If xenon flashtubes are used, refer to AC 150/5345-43, Specification for Obstruction Lighting Equipment, for guidance concerning methods of calculating effective intensity.

d. Light Colors.

(1) Airport Emergency Vehicles.

(a) **Ambulances.** Per the most current version of Federal Specification KKK-A-1822.

(b) **ARFF Vehicles.** Red or a combination of red-and-white flashing lights per the chromaticity requirements in Appendix B.

(2) Airport Security Vehicles. Signal blue or a combination of red and signal blue flashing light per the chromaticity requirements in Appendix B.

(3) Airfield Service, Aircraft Support, Airport Operations, and Other Vehicles. Yellow flashing light per the chromaticity requirements in Appendix B.

APPENDIX A. COLOR SPECIFICATIONS

A-1. SPECIFICATIONS. Colors specified in Table A-1 are per the Commission Internationale de l'Eclairage (CIE) L*a*b* system of color specification. For a description of this system, refer to American Society for Testing & Materials (ASTM) D 2244, *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.*

Standard	Ch	rome Yel	low	Yellowish-Green International				ational C)range
Illuminant D65 Usage	Vehicle Paint			Vehicle Paint			Vehicle Paint / Flag Fabric		
CIELAB DATA	L*	L* a* b* L* a* b*		L*	a*	b*			
Centroid Color	72.8	24.4	77.6	78.3	-10.2	80.4	45.0	53.5	52.0
Point 1	72.8	31.8	82.9	78.3	-9.0	92.0	45.0	61.4	47.8
Point 2	72.8	25.5	66.7	78.3	-7.6	73.2	45.0	53.9	41.4
Point 3	72.8	18.0	69.3	78.3	-11.0	69.3	45.0	53.5	53.4
Point 4	72.8	22.4	86.0	78.3	-13.4	86.2	45.0	49.7	60.4
Light Limit	77.8			83.3			49.9		
Dark Limit	67.8			73.3			41.6		
Max A E		11.1			11.7		10.7		

Table A-1.	Specification	for vehicle and	flag colors
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A-2. COLOR TESTS. Acceptable colors are those that meet the gloss rating test and either a visual or an instrumental color test as follows:

NOTE: Flag fabric colors must meet either the instrumental tests in Table A-1 or the visual method described in paragraph A-2b(1).

a. Gloss Rating Test. This test is performed per ASTM D 523, *Standard Test Method for Specular Gloss*, on a paint sample of the color to be applied on the vehicle. An acceptable color sample is high gloss with a minimum gloss rating of 70 units, for 60° geometry.

b. Color Test Methods:

(1) Visual. Prepare a master specimen of the color (per Table A-1) and gloss (per paragraph A-2a). This specimen will be the master color and be used as the basis of comparison per ASTM D 5531-05, *Standard Guide for the Preparation, Maintenance, and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings.* To verify the paint color of a vehicle visually, vehicle paint samples must be

prepared and viewed per ASTM D 1729-96 (Reapproved 2009), Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials.

(2) **Instrumental.** This test requires a test specimen sample and reference to Table A-1. All test specimen measurements should be conducted per ASTM E 1164-09a *Standard Practice for Obtaining Spectrometric Data for Object-Color Evaluation*. Test specimen tolerances must be per Table A-1 per the following:

(a) Plot the centroid color using the a* and b* CIELAB coordinate data from Table A-1 on graph paper or by entry of the coordinate data into a computer program. Plot and connect points 1 through 4 from the same table to form a quadrilateral; noting that the centroid color is within this figure. See Figure A-1 for plots of all three color specifications in Table A-1.

(b) Perform color sample measurements per ASTM E 1164-09a. If necessary, convert measurements to CIELAB L*, a*, and b* color space. See ASTM E 308-08, *Standard Practice for Computing the Colors of Objects by Using the CIE System*, for color space conversion formulae.

(c) An acceptable color is one that meets:

(i) the chromaticity requirements of the color samples a* and b* CIELAB coordinate data by falling within the quadrilateral;

(ii) the L* data lightness requirement by falling within the range defined by the light and dark data of Table A-1;

(iii) the total color difference (ΔE) by not exceeding the limits in Table A-1 when the CIELAB data are computed in the following formula:

$$\Delta E = (\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2})^{\frac{1}{2}}$$

where ΔL^* , Δa^* , and Δb^* values are the differences between those values for the centroid color in Table A-1 and those of the color sample measurements.



Figure A-1. Plot of selected color paint specifications

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APPENDIX B. COLOR SPECIFICATIONS FOR VEHICLE IDENTIFICATION LIGHTS

B-1. SPECIFICATIONS. The Society of Automotive Engineers (SAE) Standard J578 Revised December 2006, *Color Specification*, defines the acceptable color boundary limits and measurement of emitted red, white, signal blue, and yellow light for vehicle lights. This standard applies to the overall emitted color of light from the device in lieu of emitted light from any small area of the lens. The color of emitted light must fall within the color boundaries per SAE J578 Revised December 2006 (color boundary equations are in the standard) using color measurement methods detailed in the standard. See FAA Engineering Brief #67, Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures, for additional information and Alternative Lighting Devices.

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Advisory Circular

Subject: Operational Safety on Airports During Construction

Date: 12/13/2017 **Initiated By:** AAS-100 AC No: 150/5370-2G Change:

1 **Purpose.**

This AC sets forth guidelines for operational safety on airports during construction.

2 **Cancellation.**

This AC cancels AC 150/5370-2F, *Operational Safety on Airports during Construction*, dated September 29, 2011.

3 Application.

This AC assists airport operators in complying with Title 14 Code of Federal Regulations (CFR) Part 139, *Certification of Airports*. For those certificated airports, this AC provides one way, but not the only way, of meeting those requirements. The use of this AC is mandatory for those airport construction projects receiving funds under the Airport Improvement Program (AIP). See Grant Assurance No. 34, *Policies, Standards, and Specifications*. While we do not require non-certificated airports without grant agreements or airports using Passenger Facility Charge (PFC) Program funds for construction projects to adhere to these guidelines, we recommend that they do so to help these airports maintain operational safety during construction.

4 **Related Documents.**

ACs and Orders referenced in the text of this AC do not include a revision letter, as they refer to the latest version. <u>Appendix A</u> contains a list of reading material on airport construction, design, and potential safety hazards during construction, as well as instructions for obtaining these documents.

5 **Principal Changes.**

The AC incorporates the following principal changes:

1. Notification about impacts to both airport owned and FAA-owned NAVAIDs was added. See paragraph <u>2.13.5.3</u>, NAVAIDs.

- 2. Guidance for the use of orange construction signs was added. See paragraph <u>2.18.4.2</u>, Temporary Signs.
- 3. Open trenches or excavations may be permitted in the taxiway safety area while the taxiway is open to aircraft operations, subject to restrictions. See paragraph <u>2.22.3.4</u>, Excavations.
- 4. Guidance for temporary shortened runways and displaced thresholds has been enhanced. See <u>Figure 2-1</u> and <u>Figure 2-2</u>.
- 5. Figures have been improved and a new <u>Appendix F</u> on the placement of orange construction signs has been added.

Hyperlinks (allowing the reader to access documents located on the internet and to maneuver within this document) are provided throughout this document and are identified with underlined text. When navigating within this document, return to the previously viewed page by pressing the "ALT" and " \leftarrow " keys simultaneously.

Figures in this document are schematic representations and are not to scale.

6 Use of Metrics.

Throughout this AC, U.S. customary units are used followed with "soft" (rounded) conversion to metric units. The U.S. customary units govern.

7 Where to Find this AC.

You can view a list of all ACs at <u>http://www.faa.gov/regulations_policies/advisory_circulars/</u>. You can view the Federal Aviation Regulations at <u>http://www.faa.gov/regulations_policies/faa_regulations/</u>.

8 **Feedback on this AC.**

If you have suggestions for improving this AC, you may use the <u>Advisory Circular</u> <u>Feedback</u> form at the end of this AC.

ohn R. Dermody

Director of Airport Safety and Standards

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CHAPTER 1. PLANNING AN AIRFIELD CONSTRUCTION PROJECT

1.1 **Overview.**

Airports are complex environments, and procedures and conditions associated with construction activities often affect aircraft operations and can jeopardize operational safety. Safety considerations are paramount and may make operational impacts unavoidable. However, careful planning, scheduling, and coordination of construction activities can minimize disruption of normal aircraft operations and avoid situations that compromise the airport's operational safety. The airport operator must understand how construction activities and aircraft operations affect one another to be able to develop an effective plan to complete the project. While the guidance in this AC is primarily used for construction operations, the concepts, methods and procedures described may also enhance the day-to-day airport maintenance operations, such as lighting maintenance and snow removal operations.

1.2 **Plan for Safety.**

Safety, maintaining aircraft operations, and construction costs are all interrelated. Since safety must not be compromised, the airport operator must strike a balance between maintaining aircraft operations and construction costs. This balance will vary widely depending on the operational needs and resources of the airport and will require early coordination with airport users and the FAA. As the project design progresses, the necessary construction locations, activities, and associated costs will be identified and their impact to airport operations must be assessed. Adjustments are made to the proposed construction activities, often by phasing the project, and/or to airport operations to maintain operational safety. This planning effort will ultimately result in a project Construction Safety and Phasing Plan (CSPP). The development of the CSPP takes place through the following five steps:

1.2.1 Identify Affected Areas.

The airport operator must determine the geographic areas on the airport affected by the construction project. Some, such as a runway extension, will be defined by the project. Others may be variable, such as the location of haul routes and material stockpiles.

1.2.2 Describe Current Operations.

Identify the normal airport operations in each affected area for each phase of the project. This becomes the baseline from which the impact on operations by construction activities can be measured. This should include a narrative of the typical users and aircraft operating within the affected areas. It should also include information related to airport operations: the Aircraft Approach Category (AAC) and Airplane Design Group (ADG) of the airplanes that operate on each runway; the ADG and Taxiway Design Group (TDG)¹ for each affected taxiway; designated approach visibility minimums;

¹ Find Taxiway Design Group information in <u>AC 150/5300-13</u>, Airport Design.

available approach and departure procedures; most demanding aircraft; declared distances; available air traffic control services; airport Surface Movement Guidance and Control System (SMGCS) plan; and others. The applicable seasons, days and times for certain operations should also be identified as applicable.

1.2.3 <u>Allow for Temporary Changes to Operations.</u>

To the extent practical, current airport operations should be maintained during the construction. In consultation with airport users, Aircraft Rescue and Fire Fighting (ARFF) personnel, and FAA Air Traffic Organization (ATO) personnel, the airport operator should identify and prioritize the airport's most important operations. The construction activities should be planned, through project phasing if necessary, to safely accommodate these operations. When the construction activities cannot be adjusted to safely maintain current operations, regardless of their importance, then the operations must be revised accordingly. Allowable changes include temporary revisions to approach procedures, restricting certain aircraft to specific runways and taxiways, suspension of certain operations, decreased weights for some aircraft due to shortened runways, and other changes. An example of a table showing temporary operations versus current operations is shown in <u>Appendix E</u>.

1.2.4 <u>Take Required Measures to Revise Operations.</u>

Once the level and type of aircraft operations to be maintained are identified, the airport operator must determine the measures required to safely conduct the planned operations during the construction. These measures will result in associated costs, which can be broadly interpreted to include not only direct construction costs, but also loss of revenue from impacted operations. Analysis of costs may indicate a need to reevaluate allowable changes to operations. As aircraft operations and allowable changes will vary widely among airports, this AC presents general guidance on those subjects.

1.2.5 <u>Manage Safety Risk.</u>

The FAA is committed to incorporating proactive safety risk management (SRM) tools into its decision-making processes. FAA Order 5200.11, *FAA Airports (ARP) Safety Management System (SMS)*, requires the FAA to conduct a Safety Assessment for certain triggering actions. Certain airport projects may require the airport operator to provide a Project Proposal Summary to help the FAA determine whether a Safety Assessment is required prior to FAA approval of the CSPP. The airport operator must coordinate with the appropriate FAA Airports Regional or District Office early in the development of the CSPP to determine the need for a Safety Risk Assessment. If the FAA requires an assessment, the airport operator must at a minimum:

- 1. Notify the appropriate FAA Airports Regional or District Office during the project "scope development" phase of any project requiring a CSPP.
- 2. Provide documents identified by the FAA as necessary to conduct SRM.
- 3. Participate in the SRM process for airport projects.
- 4. Provide a representative to participate on the SRM panel.

5. Ensure that all applicable SRM identified risks elements are recorded and mitigated within the CSPP.

1.3 **Develop a Construction Safety and Phasing Plan (CSPP).**

Development of an effective CSPP will require familiarity with many other documents referenced throughout this AC. See <u>Appendix A</u> for a list of related reading material.

1.3.1 List Requirements.

A CSPP must be developed for each on-airfield construction project funded by the Airport Improvement Program (AIP) or located on an airport certificated under Part 139. For on-airfield construction projects at Part 139 airports funded without AIP funds, the preparation of a CSPP represents an acceptable method the certificate holder may use to meet Part 139 requirements during airfield construction activity. As per FAA Order 5200.11, projects that require Safety Assessments do not include construction, rehabilitation, or change of any facility that is entirely outside the air operations area, does not involve any expansion of the facility envelope and does not involve construction equipment, haul routes or placement of material in locations that require access to the air operations area, increase the facility envelope, or impact line-of-sight. Such facilities may include passenger terminals and parking or other structures. However, extraordinary circumstances may trigger the need for a Safety Assessment and a CSPP. The CSPP is subject to subsequent review and approval under the FAA's Safety Risk Management procedures (see paragraph <u>1.2.5</u>).

1.3.2 Prepare a Safety Plan Compliance Document (SPCD).

The Safety Plan Compliance Document (SPCD) details how the contractor will comply with the CSPP. Also, it will not be possible to determine all safety plan details (for example specific hazard equipment and lighting, contractor's points of contact, construction equipment heights) during the development of the CSPP. The successful contractor must define such details by preparing an SPCD that the airport operator reviews for approval prior to issuance of a notice-to-proceed. The SPCD is a subset of the CSPP, similar to how a shop drawing review is a subset to the technical specifications.

1.3.3 Assume Responsibility for the CSPP.

The airport operator is responsible for establishing and enforcing the CSPP. The airport operator may use the services of an engineering consultant to help develop the CSPP. However, writing the CSPP cannot be delegated to the construction contractor. Only those details the airport operator determines cannot be addressed before contract award are developed by the contractor and submitted for approval as the SPCD. The SPCD does not restate nor propose differences to provisions already addressed in the CSPP.
1.4 Who Is Responsible for Safety During Construction?

1.4.1 <u>Establish a Safety Culture.</u>

Everyone has a role in operational safety on airports during construction: the airport operator, the airport's consultants, the construction contractor and subcontractors, airport users, airport tenants, ARFF personnel, Air Traffic personnel, including Technical Operations personnel, FAA Airports Division personnel, and others, such as military personnel at any airport supporting military operations (e.g. national guard or a joint use facility). Close communication and coordination between all affected parties is the key to maintaining safe operations. Such communication and coordination should start at the project scoping meeting and continue through the completion of the project. The airport operator and contractor should conduct onsite safety inspections throughout the project and immediately remedy any deficiencies, whether caused by negligence, oversight, or project scope change.

1.4.2 <u>Assess Airport Operator's Responsibilities.</u>

An airport operator has overall responsibility for all activities on an airport, including construction. This includes the predesign, design, preconstruction, construction, and inspection phases. Additional information on the responsibilities listed below can be found throughout this AC. The airport operator must:

1.4.2.1	Develop a CSPP that complies with the safety guidelines of <u>Chapter 2</u> ,
	Construction Safety and Phasing Plans, and Chapter 3, Guidelines for
	Writing a CSPP. The airport operator may develop the CSPP internally or
	have a consultant develop the CSPP for approval by the airport operator.
	For tenant sponsored projects, approve a CSPP developed by the tenant or
	its consultant.

- 1.4.2.2 Require, review and approve the SPCD by the contractor that indicates how it will comply with the CSPP and provides details that cannot be determined before contract award.
- 1.4.2.3 Convene a preconstruction meeting with the construction contractor, consultant, airport employees and, if appropriate, tenant sponsor and other tenants to review and discuss project safety before beginning construction activity. The appropriate FAA representatives should be invited to attend the meeting. See <u>AC 150/5370-12</u>, *Quality Management for Federally Funded Airport Construction Projects*. (Note "FAA" refers to the Airports Regional or District Office, the Air Traffic Organization, Flight Standards Service, and other offices that support airport operations, flight regulations, and construction/environmental policies.)
- 1.4.2.4 Ensure contact information is accurate for each representative/point of contact identified in the CSPP and SPCD.
- 1.4.2.5 Hold weekly or, if necessary, daily safety meetings with all affected parties to coordinate activities.
- 1.4.2.6 Notify users, ARFF personnel, and FAA ATO personnel of construction and conditions that may adversely affect the operational safety of the airport via Notices to Airmen (NOTAM) and other methods, as appropriate. Convene a meeting for review and discussion if necessary.
- 1.4.2.7 Ensure construction personnel know applicable airport procedures and changes to those procedures that may affect their work.
- 1.4.2.8 Ensure that all temporary construction signs are located per the scheduled list for each phase of the project.
- 1.4.2.9 Ensure construction contractors and subcontractors undergo training required by the CSPP and SPCD.
- 1.4.2.10 Ensure vehicle and pedestrian operations addressed in the CSPP and SPCD are coordinated with airport tenants, the airport traffic control tower (ATCT), and construction contractors.
- 1.4.2.11 At certificated airports, ensure each CSPP and SPCD is consistent with Part 139.

- 1.4.2.12 Conduct inspections sufficiently frequently to ensure construction contractors and tenants comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.
- 1.4.2.13 Take immediate action to resolve safety deficiencies.
- 1.4.2.14 At airports subject to 49 CFR Part 1542, *Airport Security*, ensure construction access complies with the security requirements of that regulation.
- 1.4.2.15 Notify appropriate parties when conditions exist that invoke provisions of the CSPP and SPCD (for example, implementation of low-visibility operations).
- 1.4.2.16 Ensure prompt submittal of a Notice of Proposed Construction or Alteration (Form 7460-1) for conducting an aeronautical study of potential obstructions such as tall equipment (cranes, concrete pumps, other), stock piles, and haul routes. A separate form may be filed for each potential obstruction, or one form may be filed describing the entire construction area and maximum equipment height. In the latter case, a separate form must be filed for any object beyond or higher than the originally evaluated area/height. The FAA encourages online submittal of forms for expediency at <u>https://oeaaa.faa.gov/oeaaa/external/portal.jsp</u>. The appropriate FAA Airports Regional or District Office can provide assistance in determining which objects require an aeronautical study.
- 1.4.2.17 Ensure prompt transmission of the Airport Sponsor Strategic Event Submission, FAA Form 6000-26, located at <u>https://oeaaa.faa.gov/oeaaa/external/content/AIRPORT_SPONSOR_STR</u> <u>ATEGIC_EVENT_SUBMISSION_FORM.pdf</u>, to assure proper coordination for NAS Strategic Interruption per Service Level Agreement with ATO.
- 1.4.2.18 Promptly notify the FAA Airports Regional or District Office of any proposed changes to the CSPP prior to implementation of the change. Changes to the CSPP require review and approval by the airport operator and the FAA. The FAA Airports Regional or District office will determine if further coordination within the FAA is needed. Coordinate with appropriate local and other federal government agencies, such as Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), Transportation Security Administration (TSA), and the state environmental agency.
- 1.4.3 <u>Define Construction Contractor's Responsibilities.</u> The contractor is responsible for complying with the CSPP and SPCD. The contractor must:

- 1.4.3.1 Submit a Safety Plan Compliance Document (SPCD) to the airport operator describing how it will comply with the requirements of the CSPP and supply any details that could not be determined before contract award. The SPCD must include a certification statement by the contractor, indicating an understanding of the operational safety requirements of the CSPP and the assertion of compliance with the approved CSPP and SPCD unless written approval is granted by the airport operator. Any construction practice proposed by the contractor that does not conform to the CSPP and SPCD may impact the airport's operational safety and will require a revision to the CSPP and SPCD and re-coordination with the airport operator and the FAA in advance.
- 1.4.3.2 Have available at all times copies of the CSPP and SPCD for reference by the airport operator and its representatives, and by subcontractors and contractor employees.
- 1.4.3.3 Ensure that construction personnel are familiar with safety procedures and regulations on the airport. Provide a point of contact who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport. Many projects will require 24-hour coverage.
- 1.4.3.4 Identify in the SPCD the contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction. At least one of these employees must be on-site when active construction is taking place.
- 1.4.3.5 Conduct sufficient inspections to ensure construction personnel comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.
- 1.4.3.6 Restrict movement of construction vehicles and personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate, and as specified in the CSPP and SPCD.
- 1.4.3.7 Ensure that no contractor employees, employees of subcontractors or suppliers, or other persons enter any part of the air operations area (AOA) from the construction site unless authorized.
- 1.4.3.8 Ensure prompt submittal through the airport operator of Form 7460-1 for the purpose of conducting an aeronautical study of contractor equipment such as tall equipment (cranes, concrete pumps, and other equipment), stock piles, and haul routes when different from cases previously filed by the airport operator. The FAA encourages online submittal of forms for expediency at <u>https://oeaaa.faa.gov/oeaaa/external/portal.jsp</u>.

- 1.4.3.9 Ensure that all necessary safety mitigations are understood by all parties involved, and any special requirements of each construction phase will be fulfilled per the approved timeframe.
- 1.4.3.10 Participate in pre-construction meetings to review construction limits, safety mitigations, NOTAMs, and understand all special airport operational needs during each phase of the project.
- 1.4.4 Define Tenant's Responsibilities.

If planning construction activities on leased property, Airport tenants, such as airline operators, fixed base operators, and FAA ATO/Technical Operations sponsoring construction are strongly encouraged to:

- 1. Develop, or have a consultant develop, a project specific CSPP and submit it to the airport operator. The airport operator may forgo a complete CSPP submittal and instead incorporate appropriate operational safety principles and measures addressed in the advisory circular within their tenant lease agreements.
- 2. In coordination with its contractor, develop an SPCD and submit it to the airport operator for approval issued prior to issuance of a Notice to Proceed.
- 3. Ensure that construction personnel are familiar with safety procedures and regulations on the airport during all phases of the construction.
- 4. Provide a point of contact of who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport.
- 5. Identify in the SPCD the contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction. At least one of these employees must be on-site when active construction is taking place.
- 6. Ensure that no tenant or contractor employees, employees of subcontractors or suppliers, or any other persons enter any part of the AOA from the construction site unless authorized.
- 7. Restrict movement of construction vehicles to construction areas by flagging and barricading, erecting temporary fencing, or providing escorts, as appropriate, as specified in the CSPP and SPCD.
- 8. Ensure prompt submittal through the airport operator of Form 7460-1 for conducting an aeronautical study of contractor equipment such as tall equipment (cranes, concrete pumps, other), stock piles, and haul routes. The FAA encourages online submittal of forms for expediency at https://oeaaa.faa.gov/oeaaa/external/portal.jsp.
- 9. Participate in pre-construction meetings to review construction limits, safety mitigations, NOTAMs, and understand all special airport operational needs during each phase of the project.

CHAPTER 2. CONSTRUCTION SAFETY AND PHASING PLANS

2.1 **Overview.**

Aviation safety is the primary consideration at airports, especially during construction. The airport operator's CSPP and the contractor's Safety Plan Compliance Document (SPCD) are the primary tools to ensure safety compliance when coordinating construction activities with airport operations. These documents identify all aspects of the construction project that pose a potential safety hazard to airport operations and outline respective mitigation procedures for each hazard. They must provide information necessary for the Airport Operations department to conduct airfield inspections and expeditiously identify and correct unsafe conditions during construction. All aviation safety provisions included within the project drawings, contract specifications, and other related documents must also be reflected in the CSPP and SPCD.

2.2 Assume Responsibility.

Operational safety on the airport remains the airport operator's responsibility at all times. The airport operator must develop, certify, and submit for FAA approval each CSPP. It is the airport operator's responsibility to apply the requirements of the FAA approved CSPP. The airport operator must revise the CSPP when conditions warrant changes and must submit the revised CSPP to the FAA for approval. The airport operator must also require and approve a SPCD from the project contractor.

2.3 **Submit the CSPP.**

Construction Safety and Phasing Plans should be developed concurrently with the project design. Milestone versions of the CSPP should be submitted for review and approval as follows. While these milestones are not mandatory, early submission will help to avoid delays. Submittals are preferred in 8.5×11 inch or 11×17 inch format for compatibility with the FAA's Obstruction Evaluation / Airport Airspace Analysis (OE / AAA) process.

2.3.1 <u>Submit an Outline/Draft.</u>

By the time approximately 25% to 30% of the project design is completed, the principal elements of the CSPP should be established. Airport operators are encouraged to submit an outline or draft, detailing all CSPP provisions developed to date, to the FAA for review at this stage of the project design.

2.3.2 <u>Submit a CSPP.</u>

The CSPP should be formally submitted for FAA approval when the project design is 80 percent to 90 percent complete. Since provisions in the CSPP will influence contract costs, it is important to obtain FAA approval in time to include all such provisions in the procurement contract.

2.3.3 <u>Submit an SPCD.</u>

The contractor should submit the SPCD to the airport operator for approval to be issued prior to the Notice to Proceed.

2.3.4 <u>Submit CSPP Revisions.</u>

All revisions to a previously approved CSPP must be re-submitted to the FAA for review and approval/disapproval action.

2.4 **Meet CSPP Requirements.**

- 2.4.1 To the extent possible, the CSPP should address the following as outlined in <u>Chapter 3</u>, <u>Guidelines for Writing a CSPP</u>. Details that cannot be determined at this stage are to be included in the SPCD.
 - 1. Coordination.
 - a. Contractor progress meetings.
 - b. Scope or schedule changes.
 - c. FAA ATO coordination.
 - 2. Phasing.
 - a. Phase elements.
 - b. Construction safety drawings.
 - 3. Areas and operations affected by the construction activity.
 - a. Identification of affected areas.
 - b. Mitigation of effects.
 - 4. Protection of navigation aids (NAVAIDs).
 - 5. Contractor access.
 - a. Location of stockpiled construction materials.
 - b. Vehicle and pedestrian operations.
 - 6. Wildlife management.
 - a. Trash.
 - b. Standing water.
 - c. Tall grass and seeds.
 - d. Poorly maintained fencing and gates.
 - e. Disruption of existing wildlife habitat.
 - 7. Foreign Object Debris (FOD) management.
 - 8. Hazardous materials (HAZMAT) management.
 - 9. Notification of construction activities.

- a. Maintenance of a list of responsible representatives/ points of contact.
- b. NOTAM.
- c. Emergency notification procedures.
- d. Coordination with ARFF Personnel.
- e. Notification to the FAA.
- 10. Inspection requirements.
 - a. Daily (or more frequent) inspections.
 - b. Final inspections.
- 11. Underground utilities.
- 12. Penalties.
- 13. Special conditions.
- 14. Runway and taxiway visual aids. Marking, lighting, signs, and visual NAVAIDs.
 - a. General.
 - b. Markings.
 - c. Lighting and visual NAVAIDs.
 - d. Signs, temporary, including orange construction signs, and permanent signs.
- 15. Marking and signs for access routes.
- 16. Hazard marking and lighting.
 - a. Purpose.
 - b. Equipment.
- 17. Work zone lighting for nighttime construction (if applicable).
- 18. Protection of runway and taxiway safety areas, object free areas, obstacle free zones, and approach/departure surfaces.
 - a. Runway Safety Area (RSA).
 - b. Runway Object Free Area (ROFA).
 - c. Taxiway Safety Area (TSA). Provide details for any adjustments to Taxiway Safety Area width to allow continued operation of smaller aircraft. See paragraph <u>2.22.3</u>.
 - d. Taxiway Object Free Area (TOFA). Provide details for any continued aircraft operations while construction occurs within the TOFA. See paragraph <u>2.22.4</u>.
 - e. Obstacle Free Zone (OFZ).
 - f. Runway approach/departure surfaces.
- 19. Other limitations on construction.
 - a. Prohibitions.

b. Restrictions.

- 2.4.2 The Safety Plan Compliance Document (SPCD) should include a general statement by the construction contractor that he/she has read and will abide by the CSPP. In addition, the SPCD must include all supplemental information that could not be included in the CSPP prior to the contract award. The contractor statement should include the name of the contractor, the title of the project CSPP, the approval date of the CSPP, and a reference to any supplemental information (that is, "I, (Name of Contractor), have read the (Title of Project) CSPP, approved on (Date), and will abide by it as written and with the following additions as noted:"). The supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding CSPP subject number and title. If no supplemental information," should be written after the corresponding subject title. The SPCD should not duplicate information in the CSPP:
 - 1. Coordination. Discuss details of proposed safety meetings with the airport operator and with contractor employees and subcontractors.
 - 2. Phasing. Discuss proposed construction schedule elements, including:
 - a. Duration of each phase.
 - b. Daily start and finish of construction, including "night only" construction.
 - c. Duration of construction activities during:
 - i. Normal runway operations.
 - ii. Closed runway operations.
 - iii. Modified runway "Aircraft Reference Code" usage.
 - 3. Areas and operations affected by the construction activity. These areas and operations should be identified in the CSPP and should not require an entry in the SPCD.
 - 4. Protection of NAVAIDs. Discuss specific methods proposed to protect operating NAVAIDs.
 - 5. Contractor access. Provide the following:
 - a. Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other).
 - b. Listing of individuals requiring driver training (for certificated airports and as requested).
 - c. Radio communications.
 - i. Types of radios and backup capabilities.
 - ii. Who will be monitoring radios.
 - iii. Who to contact if the ATCT cannot reach the contractor's designated person by radio.

- d. Details on how the contractor will escort material delivery vehicles.
- 6. Wildlife management. Discuss the following:
 - a. Methods and procedures to prevent wildlife attraction.
 - b. Wildlife reporting procedures.
- 7. Foreign Object Debris (FOD) management. Discuss equipment and methods for control of FOD, including construction debris and dust.
- 8. Hazardous Materials (HAZMAT) management. Discuss equipment and methods for responding to hazardous spills.
- 9. Notification of construction activities. Provide the following:
 - a. Contractor points of contact.
 - b. Contractor emergency contact.
 - c. Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator.
 - d. Batch plant details, including 7460-1 submittal.
- 10. Inspection requirements. Discuss daily (or more frequent) inspections and special inspection procedures.
- 11. Underground utilities. Discuss proposed methods of identifying and protecting underground utilities.
- 12. Penalties. Penalties should be identified in the CSPP and should not require an entry in the SPCD.
- 13. Special conditions. Discuss proposed actions for each special condition identified in the CSPP.
- 14. Runway and taxiway visual aids. Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:
 - a. Equipment and methods for covering signage and airfield lights.
 - b. Equipment and methods for temporary closure markings (paint, fabric, other).
 - c. Temporary orange construction signs.
 - d. Types of temporary Visual Guidance Slope Indicators (VGSI).
- 15. Marking and signs for access routes. Discuss proposed methods of demarcating access routes for vehicle drivers.
- 16. Hazard marking and lighting. Discuss proposed equipment and methods for identifying excavation areas.
- 17. Work zone lighting for nighttime construction (if applicable). Discuss proposed equipment, locations, aiming, and shielding to prevent interference with air traffic control and aircraft operations.

- 18. Protection of runway and taxiway safety areas, object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:
 - a. Equipment and methods for maintaining Taxiway Safety Area standards.
 - b. Equipment and methods to ensure the safe passage of aircraft where Taxiway Safety Area or Taxiway Object Free Area standards cannot be maintained.
 - c. Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.
- 19. Other limitations on construction should be identified in the CSPP and should not require an entry in the SPCD.

2.5 **Coordination.**

Airport operators, or tenants responsible for design, bidding and conducting construction on their leased properties, should ensure at all project developmental stages, such as predesign, prebid, and preconstruction conferences, they capture the subject of airport operational safety during construction (see <u>AC 150/5370-12</u>, *Quality Management for Federally Funded Airport Construction Projects*). In addition, the following should be coordinated as required:

2.5.1 Progress Meetings.

Operational safety should be a standing agenda item for discussion during progress meetings throughout the project developmental stages.

2.5.2 <u>Scope or Schedule Changes.</u>

Changes in the scope or duration at any of the project stages may require revisions to the CSPP and review and approval by the airport operator and the FAA (see paragraph 1.4.2.17).

2.5.3 FAA ATO Coordination.

Early coordination with FAA ATO is highly recommended during the design phase and is required for scheduling Technical Operations shutdowns prior to construction. Coordination is critical to restarts of NAVAID services and to the establishment of any special procedures for the movement of aircraft. Formal agreements between the airport operator and appropriate FAA offices are recommended. All relocation or adjustments to NAVAIDs, or changes to final grades in critical areas, should be coordinated with FAA ATO and may require an FAA flight inspection prior to restarting the facility. Flight inspections must be coordinated and scheduled well in advance of the intended facility restart. Flight inspections may require a reimbursable agreement between the airport operator and FAA ATO. Reimbursable agreements should be coordinated a minimum of 12 months prior to the start of construction. (See paragraph <u>2.13.5.3.2</u> for required FAA notification regarding FAA-owned NAVAIDs.)

2.6 **Phasing.**

Once it has been determined what types and levels of airport operations will be maintained, the most efficient sequence of construction may not be feasible. In this case, the sequence of construction may be phased to gain maximum efficiency while allowing for the required operations. The development of the resulting construction phases should be coordinated with local Air Traffic personnel and airport users. The sequenced construction phases established in the CSPP must be incorporated into the project design and must be reflected in the contract drawings and specifications.

2.6.1 <u>Phase Elements.</u>

For each phase the CSPP should detail:

- Areas closed to aircraft operations.
- Duration of closures.
- Taxi routes and/or areas of reduced TSA and TOFA to reflect reduced ADG use.
- ARFF access routes.
- Construction staging, disposal, and cleanout areas.
- Construction access and haul routes.
- Impacts to NAVAIDs.
- Lighting, marking, and signing changes.
- Available runway length and/or reduced RSA and ROFA to reflect reduced ADG use.
- Declared distances (if applicable).
- Required hazard marking, lighting, and signing.
- Work zone lighting for nighttime construction (if applicable).
- Lead times for required notifications.

2.6.2 <u>Construction Safety Drawings.</u>

Drawings specifically indicating operational safety procedures and methods in affected areas (i.e., construction safety drawings) should be developed for each construction phase. Such drawings should be included in the CSPP as referenced attachments and should also be included in the contract drawing package.

2.7 Areas and Operations Affected by Construction Activity.

Runways and taxiways should remain in use by aircraft to the maximum extent possible without compromising safety. Pre-meetings with the FAA ATO will support operational simulations. See <u>Appendix E</u> for an example of a table showing temporary operations versus current operations. The tables in <u>Appendix E</u> can be useful for coordination among all interested parties, including FAA Lines of Business.

2.7.1 Identification of Affected Areas.

Identifying areas and operations affected by the construction helps to determine possible safety problems. The affected areas should be identified in the construction safety drawings for each construction phase. (See paragraph 2.6.2.) Of particular concern are:

2.7.1.1 Closing, or Partial Closing, of Runways, Taxiways and Aprons, and Displaced Thresholds.

When a runway is partially closed, a portion of the pavement is unavailable for any aircraft operation, meaning taxiing, landing, or takeoff in either direction on that pavement is prohibited. A displaced threshold, by contrast, is established to ensure obstacle clearance and adequate safety area for landing aircraft. The pavement prior to the displaced threshold is normally available for take-off in the direction of the displacement and for landing and takeoff in the opposite direction. Misunderstanding this difference, may result in issuance of an inaccurate NOTAM, and can lead to a hazardous condition.

2.7.1.1.1 <u>Partially Closed Runways.</u>

The temporarily closed portion of a partially closed runway will generally extend from the threshold to a taxiway that may be used for entering and exiting the runway. If the closed portion extends to a point between taxiways, pilots will have to back-taxi on the runway, which is an undesirable operation. See <u>Figure 2-1</u> for a desirable configuration.

2.7.1.1.2 <u>Displaced Thresholds.</u>

Since the portion of the runway pavement between the permanent threshold and a standard displaced threshold is available for takeoff and for landing in the opposite direction, the temporary displaced threshold need not be located at an entrance/exit taxiway. See <u>Figure 2-2</u>.

- 2.7.1.2 Closing of aircraft rescue and fire fighting access routes.
- 2.7.1.3 Closing of access routes used by airport and airline support vehicles.
- 2.7.1.4 Interruption of utilities, including water supplies for fire fighting.
- 2.7.1.5 Approach/departure surfaces affected by heights of objects.
- 2.7.1.6 Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads.



Figure 2-1. Temporary Partially Closed Runway



Figure 2-2. Temporary Displaced Threshold

Note: See paragraph 2.18.2.5.

2.7.2 <u>Mitigation of Effects.</u>

Establishment of specific procedures is necessary to maintain the safety and efficiency of airport operations. The CSPP must address:

- 2.7.2.1 Temporary changes to runway and/or taxi operations.
- 2.7.2.2 Detours for ARFF and other airport vehicles.
- 2.7.2.3 Maintenance of essential utilities.
- 2.7.2.4 Temporary changes to air traffic control procedures. Such changes must be coordinated with the ATO.

2.8 Navigation Aid (NAVAID) Protection.

Before commencing construction activity, parking vehicles, or storing construction equipment and materials near a NAVAID, coordinate with the appropriate FAA ATO/Technical Operations office to evaluate the effect of construction activity and the required distance and direction from the NAVAID. (See paragraph 2.13.5.3.) Construction activities, materials/equipment storage, and vehicle parking near electronic NAVAIDs require special consideration since they may interfere with signals essential to air navigation. If any NAVAID may be affected, the CSPP and SPCD must show an understanding of the "critical area" associated with each NAVAID and describe how it will be protected. Where applicable, the operational critical areas of NAVAIDs should be graphically delineated on the project drawings. Pay particular attention to stockpiling material, as well as to movement and parking of equipment that may interfere with line of sight from the ATCT or with electronic emissions. Interference from construction equipment and activities may require NAVAID shutdown or adjustment of instrument approach minimums for low visibility operations. This condition requires that a NOTAM be filed (see paragraph 2.13.2). Construction activities and materials/equipment storage near a NAVAID must not obstruct access to the equipment and instruments for maintenance. Submittal of a 7460-1 form is required for construction vehicles operating near FAA NAVAIDs. (See paragraph 2.13.5.3.)

2.9 **Contractor Access.**

The CSPP must detail the areas to which the contractor must have access, and explain how contractor personnel will access those areas. Specifically address:

2.9.1 Location of Stockpiled Construction Materials.

Stockpiled materials and equipment storage are not permitted within the RSA and OFZ, and if possible should not be permitted within the Object Free Area (OFA) of an operational runway. Stockpiling material in the OFA requires submittal of a 7460-1 form and justification provided to the appropriate FAA Airports Regional or District Office for approval. The airport operator must ensure that stockpiled materials and equipment adjacent to these areas are prominently marked and lighted during hours of restricted visibility or darkness. (See paragraph <u>2.18.2</u>.) This includes determining and

verifying that materials are stabilized and stored at an approved location so as not to be a hazard to aircraft operations and to prevent attraction of wildlife and foreign object damage from blowing or tracked material. See paragraphs 2.10 and 2.11.

2.9.2 <u>Vehicle and Pedestrian Operations.</u>

The CSPP should include specific vehicle and pedestrian requirements. Vehicle and pedestrian access routes for airport construction projects must be controlled to prevent inadvertent or unauthorized entry of persons, vehicles, or animals onto the AOA. The airport operator should coordinate requirements for vehicle operations with airport tenants, contractors, and the FAA air traffic manager. In regard to vehicle and pedestrian operations, the CSPP should include the following, with associated training requirements:

2.9.2.1 **Construction Site Parking.**

Designate in advance vehicle parking areas for contractor employees to prevent any unauthorized entry of persons or vehicles onto the AOA. These areas should provide reasonable contractor employee access to the job site.

2.9.2.2 Construction Equipment Parking.

Contractor employees must park and service all construction vehicles in an area designated by the airport operator outside the OFZ and never in the safety area of an active runway or taxiway. Unless a complex setup procedure makes movement of specialized equipment infeasible, inactive equipment must not be parked on a closed taxiway or runway. If it is necessary to leave specialized equipment on a closed taxiway or runway at night, the equipment must be well lighted. Employees should also park construction vehicles outside the OFA when not in use by construction personnel (for example, overnight, on weekends, or during other periods when construction is not active). Parking areas must not obstruct the clear line of sight by the ATCT to any taxiways or runways under air traffic control nor obstruct any runway visual aids, signs, or navigation aids. The FAA must also study those areas to determine effects on airport design criteria, surfaces established by 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace (Part 77), and on NAVAIDs and Instrument Approach Procedures (IAP). See paragraph 2.13.1 for further information.

2.9.2.3 Access and Haul Roads.

Determine the construction contractor's access to the construction sites and haul roads. Do not permit the construction contractor to use any access or haul roads other than those approved. Access routes used by contractor vehicles must be clearly marked to prevent inadvertent entry to areas open to airport operations. Pay special attention to ensure that if construction traffic is to share or cross any ARFF routes that ARFF right of way is not impeded at any time, and that construction traffic on haul roads does not interfere with NAVAIDs or approach surfaces of operational runways. Address whether access gates will be blocked or inoperative or if a rally point will be blocked or inaccessible.

- 2.9.2.4 Marking and lighting of vehicles in accordance with <u>AC 150/5210-5</u>, *Painting, Marking, and Lighting of Vehicles Used on an Airport.*
- 2.9.2.5 Description of proper vehicle operations on various areas under normal, lost communications, and emergency conditions.
- 2.9.2.6 Required escorts.
- 2.9.2.7 **Training Requirements for Vehicle Drivers to Ensure Compliance** with the Airport Operator's Vehicle Rules and Regulations.

Specific training should be provided to vehicle operators, including those providing escorts. See <u>AC 150/5210-20</u>, *Ground Vehicle Operations on Airports*, for information on training and records maintenance requirements.

2.9.2.8 Situational Awareness.

Vehicle drivers must confirm by personal observation that no aircraft is approaching their position (either in the air or on the ground) when given clearance to cross a runway, taxiway, or any other area open to airport operations. In addition, it is the responsibility of the escort vehicle driver to verify the movement/position of all escorted vehicles at any given time. At non-towered airports, all aircraft movements and flight operations rely on aircraft operators to self-report their positions and intentions. However, there is no requirement for an aircraft to have radio communications. Because aircraft do not always broadcast their positions or intentions, visual checking, radio monitoring, and situational awareness of the surroundings is critical to safety.

2.9.2.9 **Two-Way Radio Communication Procedures.**

2.9.2.9.1 <u>General.</u>

The airport operator must ensure that tenant and construction contractor personnel engaged in activities involving unescorted operation on aircraft movement areas observe the proper procedures for communications, including using appropriate radio frequencies at airports with and without ATCT. When operating vehicles on or near open runways or taxiways, construction personnel must understand the critical importance of maintaining radio contact, as directed by the airport operator, with:

- 1. Airport operations
- 2. ATCT

- 3. Common Traffic Advisory Frequency (CTAF), which may include UNICOM, MULTICOM.
- 4. Automatic Terminal Information Service (ATIS). This frequency is useful for monitoring conditions on the airport. Local air traffic will broadcast information regarding construction related runway closures and "shortened" runways on the ATIS frequency.
- 2.9.2.9.2 <u>Areas Requiring Two-Way Radio Communication with the ATCT.</u> Vehicular traffic crossing active movement areas must be controlled either by two-way radio with the ATCT, escort, flagman, signal light, or other means appropriate for the particular airport.
- 2.9.2.9.3 Frequencies to be Used.

The airport operator will specify the frequencies to be used by the contractor, which may include the CTAF for monitoring of aircraft operations. Frequencies may also be assigned by the airport operator for other communications, including any radio frequency in compliance with Federal Communications Commission requirements. At airports with an ATCT, the airport operator will specify the frequency assigned by the ATCT to be used between contractor vehicles and the ATCT.

- 2.9.2.9.4 Proper radio usage, including read back requirements.
- 2.9.2.9.5 Proper phraseology, including the International Phonetic Alphabet.
- 2.9.2.9.6 Light Gun Signals.

Even though radio communication is maintained, escort vehicle drivers must also familiarize themselves with ATCT light gun signals in the event of radio failure. See the FAA safety placard "Ground Vehicle Guide to Airport Signs and Markings." This safety placard may be downloaded through the Runway Safety Program Web site at <u>http://www.faa.gov/airports/runway_safety/publications/</u> (see "Signs & Markings Vehicle Dashboard Sticker") or obtained from the FAA Airports Regional Office.

2.9.2.10 Maintenance of the secured area of the airport, including:

2.9.2.10.1 Fencing and Gates.

Airport operators and contractors must take care to maintain security during construction when access points are created in the security fencing to permit the passage of construction vehicles or personnel. Temporary gates should be equipped so they can be securely closed and locked to prevent access by animals and unauthorized people. Procedures should be in place to ensure that only authorized persons and vehicles have access to the AOA and to prohibit "piggybacking" behind another person or vehicle. The Department of Transportation (DOT) document DOT/FAA/AR- 00/52, *Recommended Security Guidelines for Airport Planning and Construction*, provides more specific information on fencing. A copy of this document can be obtained from the Airport Consultants Council, Airports Council International, or American Association of Airport Executives.

2.9.2.10.2 <u>Badging Requirements.</u>

Airports subject to 49 CFR Part 1542, *Airport Security*, must meet standards for access control, movement of ground vehicles, and identification of construction contractor and tenant personnel.

2.10 Wildlife Management.

The CSPP and SPCD must be in accordance with the airport operator's wildlife hazard management plan, if applicable. See <u>AC 150/5200-33</u>, *Hazardous Wildlife Attractants On or Near Airports*, and CertAlert 98-05, *Grasses Attractive to Hazardous Wildlife*. Construction contractors must carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports, such as:

2.10.1 <u>Trash.</u>

Food scraps must be collected from construction personnel activity.

2.10.2 Standing Water.

2.10.3 <u>Tall Grass and Seeds.</u>

Requirements for turf establishment can be at odds with requirements for wildlife control. Grass seed is attractive to birds. Lower quality seed mixtures can contain seeds of plants (such as clover) that attract larger wildlife. Seeding should comply with the guidance in <u>AC 150/5370-10</u>, *Standards for Specifying Construction of Airports*, Item T-901, Seeding. Contact the local office of the United Sates Department of Agriculture Soil Conservation Service or the State University Agricultural Extension Service (County Agent or equivalent) for assistance and recommendations. These agencies can also provide liming and fertilizer recommendations.

2.10.4 <u>Poorly Maintained Fencing and Gates.</u> See paragraph 2.9.2.10.1.

2.10.5 Disruption of Existing Wildlife Habitat.

While this will frequently be unavoidable due to the nature of the project, the CSPP should specify under what circumstances (location, wildlife type) contractor personnel should immediately notify the airport operator of wildlife sightings.

2.11 Foreign Object Debris (FOD) Management.

Waste and loose materials, commonly referred to as FOD, are capable of causing damage to aircraft landing gears, propellers, and jet engines. Construction contractors must not leave or place FOD on or near active aircraft movement areas. Materials capable of creating FOD must be continuously removed during the construction project. Fencing (other than security fencing) or covers may be necessary to contain material that can be carried by wind into areas where aircraft operate. See <u>AC 150/5210-24</u>, *Foreign Object Debris (FOD) Management*.

2.12 Hazardous Materials (HAZMAT) Management.

Contractors operating construction vehicles and equipment on the airport must be prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks. Transport and handling of other hazardous materials on an airport also requires special procedures. See <u>AC 150/5320-15</u>, *Management of Airport Industrial Waste*.

2.13 Notification of Construction Activities.

The CSPP and SPCD must detail procedures for the immediate notification of airport users and the FAA of any conditions adversely affecting the operational safety of the airport. It must address the notification actions described below, as applicable.

2.13.1 List of Responsible Representatives/points of contact for all involved parties, and procedures for contacting each of them, including after hours.

2.13.2 <u>NOTAMs.</u>

Only the airport operator may initiate or cancel NOTAMs on airport conditions, and is the only entity that can close or open a runway. The airport operator must coordinate the issuance, maintenance, and cancellation of NOTAMs about airport conditions resulting from construction activities with tenants and the local air traffic facility (control tower, approach control, or air traffic control center), and must either enter the NOTAM into NOTAM Manager, or provide information on closed or hazardous conditions on airport movement areas to the FAA Flight Service Station (FSS) so it can issue a NOTAM. The airport operator must file and maintain a list of authorized representatives with the FSS. Refer to <u>AC 150/5200-28</u>, *Notices to Airmen (NOTAMs) for Airport Operators*, for a sample NOTAM form. Only the FAA may issue or cancel NOTAMs on shutdown or irregular operation of FAA owned facilities. Any person having reason to believe that a NOTAM is missing, incomplete, or inaccurate must notify the airport operator. See paragraph <u>2.7.1.1</u> about issuing NOTAMs for partially closed runways versus runways with displaced thresholds.

2.13.3 Emergency notification procedures for medical, fire fighting, and police response.

2.13.4 Coordination with ARFF.

The CSPP must detail procedures for coordinating through the airport sponsor with ARFF personnel, mutual aid providers, and other emergency services if construction requires:

- 1. The deactivation and subsequent reactivation of water lines or fire hydrants, or
- 2. The rerouting, blocking and restoration of emergency access routes, or
- 3. The use of hazardous materials on the airfield.

2.13.5 Notification to the FAA.

2.13.5.1 **Part 77.**

Any person proposing construction or alteration of objects that affect navigable airspace, as defined in Part 77, must notify the FAA. This includes construction equipment and proposed parking areas for this equipment (i.e., cranes, graders, other equipment) on airports. FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, can be used for this purpose and submitted to the appropriate FAA Airports Regional or District Office. See <u>Appendix A</u> to download the form. Further guidance is available on the FAA web site at <u>oeaaa.faa.gov</u>.

2.13.5.2 **Part 157.**

With some exceptions, Title 14 CFR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*, requires that the airport operator notify the FAA in writing whenever a non-Federally funded project involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport. Notification involves submitting FAA Form 7480-1, Notice of Landing Area Proposal, to the nearest FAA Airports Regional or District Office. See <u>Appendix A</u> to download the form.

2.13.5.3 NAVAIDs.

For emergency (short-notice) notification about impacts to both airport owned and FAA owned NAVAIDs, contact: 866-432-2622.

2.13.5.3.1 Airport Owned/FAA Maintained.

If construction operations require a shutdown of 24 hours or greater in duration, or more than 4 hours daily on consecutive days, of a NAVAID owned by the airport but maintained by the FAA, provide a 45-day minimum notice to FAA ATO/Technical Operations prior to facility shutdown, using Strategic Event Coordination (SEC) Form 6000.26 contained within FAA Order 6000.15, *General Maintenance Handbook for National Airspace System (NAS) Facilities*.

2.13.5.3.2 FAA Owned.

- 1. The airport operator must notify the appropriate FAA ATO Service Area Planning and Requirements (P&R) Group a minimum of 45 days prior to implementing an event that causes impacts to NAVAIDs, using SEC Form 6000.26.
- 2. Coordinate work for an FAA owned NAVAID shutdown with the local FAA ATO/Technical Operations office, including any necessary reimbursable agreements and flight checks. Detail procedures that address unanticipated utility outages and cable cuts that could impact FAA NAVAIDs. Refer to active Service Level Agreement with ATO for specifics.

2.14 **Inspection Requirements.**

2.14.1 Daily Inspections.

Inspections should be conducted at least daily, but more frequently if necessary to ensure conformance with the CSPP. A sample checklist is provided in <u>Appendix D</u>, <u>Construction Project Daily Safety Inspection Checklist</u>. See also <u>AC 150/5200-18</u>, *Airport Safety Self-Inspection*. Airport operators holding a Part 139 certificate are required to conduct self-inspections during unusual conditions, such as construction activities, that may affect safe air carrier operations.

2.14.2 Interim Inspections.

Inspections should be conducted of all areas to be (re)opened to aircraft traffic to ensure the proper operation of lights and signs, for correct markings, and absence of FOD. The contractor should conduct an inspection of the work area with airport operations personnel. The contractor should ensure that all construction materials have been secured, all pavement surfaces have been swept clean, all transition ramps have been properly constructed, and that surfaces have been appropriately marked for aircraft to operate safely. Only if all items on the list meet with the airport operator's approval should the air traffic control tower be notified to open the area to aircraft operations. The contractor should be required to retain a suitable workforce and the necessary equipment at the work area for any last minute cleanup that may be requested by the airport operator prior to opening the area.

2.14.3 Final Inspections.

New runways and extended runway closures may require safety inspections at certificated airports prior to allowing air carrier service. Coordinate with the FAA Airport Certification Safety Inspector (ACSI) to determine if a final inspection will be necessary.

2.15 Underground Utilities.

The CSPP and/or SPCD must include procedures for locating and protecting existing underground utilities, cables, wires, pipelines, and other underground facilities in excavation areas. This may involve coordinating with public utilities and FAA ATO/Technical Operations. Note that "One Call" or "Miss Utility" services do not include FAA ATO/Technical Operations.

2.16 **Penalties.**

The CSPP should detail penalty provisions for noncompliance with airport rules and regulations and the safety plans (for example, if a vehicle is involved in a runway incursion). Such penalties typically include rescission of driving privileges or access to the AOA.

2.17 **Special Conditions.**

The CSPP must detail any special conditions that affect the operation of the airport and will require the activation of any special procedures (for example, low-visibility operations, snow removal, aircraft in distress, aircraft accident, security breach, Vehicle / Pedestrian Deviation (VPD) and other activities requiring construction suspension/resumption).

2.18 **Runway and Taxiway Visual Aids.**

This includes marking, lighting, signs, and visual NAVAIDs. The CSPP must ensure that areas where aircraft will be operating are clearly and visibly separated from construction areas, including closed runways. Throughout the duration of the construction project, verify that these areas remain clearly marked and visible at all times and that marking, lighting, signs, and visual NAVAIDs that are to continue to perform their functions during construction remain in place and operational. Visual NAVAIDs that are not serving their intended function during construction must be temporarily disabled, covered, or modified as necessary. The CSPP must address the following, as appropriate:

2.18.1 General.

Airport markings, lighting, signs, and visual NAVAIDs must be clearly visible to pilots, not misleading, confusing, or deceptive. All must be secured in place to prevent movement by prop wash, jet blast, wing vortices, and other wind currents and constructed of materials that will minimize damage to an aircraft in the event of inadvertent contact. Items used to secure such markings must be of a color similar to the marking.

2.18.2 Markings.

During the course of construction projects, temporary pavement markings are often required to allow for aircraft operations during or between work periods. During the design phase of the project, the designer should coordinate with the project manager, airport operations, airport users, the FAA Airports project manager, and Airport Certification Safety Inspector for Part 139 airports to determine minimum temporary markings. The FAA Airports project manager will, wherever a runway is closed, coordinate with the appropriate FAA Flight Standards Office and disseminate findings to all parties. Where possible, the temporary markings on finish grade pavements should be placed to mirror the dimensions of the final markings. Markings must be in compliance with the standards of <u>AC 150/5340-1</u>, *Standards for Airport Markings*, except as noted herein. Runways and runway exit taxiways closed to aircraft operations are marked with a yellow X. The preferred visual aid to depict temporary runway closure is the lighted X signal placed on or near the runway designation numbers. (See paragraph <u>2.18.2.1.2</u>.)

2.18.2.1 **Closed Runways and Taxiways.**

2.18.2.1.1 <u>Permanently Closed Runways.</u>

For runways, obliterate the threshold marking, runway designation marking, and touchdown zone markings, and place an X at each end and at 1,000-foot (300 m) intervals. For a multiple runway environment, if the lighted X on a designated number will be located in the RSA of an adjacent active runway, locate the lighted X farther down the closed runway to clear the RSA of the active runway. In addition, the closed runway numbers located in the RSA of an active runway must be marked with a flat yellow X.

2.18.2.1.2 <u>Temporarily Closed Runways.</u>

For runways that have been temporarily closed, place an X at each end of the runway directly on or as near as practicable to the runway designation numbers. For a multiple runway environment, if the lighted X on a designated number will be located in the RSA of an adjacent active runway, locate the lighted X farther down the closed runway to clear the RSA of the active runway. In addition, the closed runway numbers located in the RSA of an active runway must be marked with a flat yellow X. See <u>Figure 2-3</u>. See also paragraph 2.18.3.3.

2.18.2.1.3 Partially Closed Runways and Displaced Thresholds.

When threshold markings are needed to identify the temporary beginning of the runway that is available for landing, the markings must comply with <u>AC 150/5340-1</u>. An X is not used on a partially closed runway or a runway with a displaced threshold. See paragraph <u>2.7.1.1</u> for the difference between partially closed runways and runways with displaced thresholds. Because of the temporary nature of threshold displacement due to construction, it is not necessary to re-adjust the existing runway centerline markings to meet standard spacing for a runway with a visual approach. Some of the requirements below may be waived in the cases of low-activity airports and/or short duration changes that are measured in days rather than weeks. Consider whether the presence of an airport traffic

control tower allows for the development of special procedures. Contact the appropriate FAA Airports Regional or District Office for assistance.



Figure 2-3. Markings for a Temporarily Closed Runway

- 1. **Partially Closed Runways.** Pavement markings for temporary closed portions of the runway consist of a runway threshold bar, runway designation, and yellow chevrons to identify pavement areas that are unsuitable for takeoff or landing (see <u>AC 150/5340-1</u>). Obliterate or cover markings prior to the moved threshold. Existing touchdown zone markings beyond the moved threshold may remain in place. Obliterate aiming point markings. Issue appropriate NOTAMs regarding any nonstandard markings. See Figure 2-4.
- Displaced Thresholds. Pavement markings for a displaced threshold consist of a runway threshold bar, runway designation, and white arrowheads with and without arrow shafts. These markings are required to identify the portion of the runway before the displaced threshold to provide centerline guidance for pilots during approaches, takeoffs, and landing rollouts from the opposite direction. See <u>AC</u> <u>150/5340-1</u>. Obliterate markings prior to the displaced threshold. Existing touchdown zone markings beyond the displaced threshold may remain in place. Obliterate aiming point markings. Issue appropriate NOTAMs regarding any nonstandard markings. See <u>Figure 2-2</u>.

2.18.2.1.4 <u>Taxiways.</u>

1. **Permanently Closed Taxiways.** <u>AC 150/5300-13</u> *Airport Design,* notes that it is preferable to remove the pavement, but for pavement that is to remain, place an X at the entrance to both ends of the closed section. Obliterate taxiway centerline markings, including runway leadoff lines, leading to the closed taxiway. See <u>Figure 2-4</u>.

Figure 2-4. Temporary Taxiway Closure



2. **Temporarily Closed Taxiways.** Place barricades outside the safety area of intersecting taxiways. For runway/taxiway intersections, place an X at the entrance to the closed taxiway from the runway. If the taxiway will be closed for an extended period, obliterate taxiway centerline markings, including runway leadoff lines and taxiway to taxiway turns, leading to the closed section. Always obliterate runway lead-off lines for high speed exits, regardless of the duration of the closure. If the centerline markings will be reused upon reopening the taxiway, it is preferable to paint over the marking. This will result in less damage to the pavement when the upper layer of paint is ultimately removed. See Figure 2-4.

2.18.2.1.5 <u>Temporarily Closed Airport.</u> When the airport is closed temporarily, mark all the runways as closed.

- 2.18.2.2 If unable to paint temporary markings on the pavement, construct them from any of the following materials: fabric, colored plastic, painted sheets of plywood, or similar materials. They must be properly configured and appropriately secured to prevent movement by prop wash, jet blast, or other wind currents. Items used to secure such markings must be of a color similar to the marking.
- 2.18.2.3 It may be necessary to remove or cover runway markings, including but not limited to, runway designation markings, threshold markings, centerline markings, edge stripes, touchdown zone markings and aiming point markings, depending on the length of construction and type of activity at the airport. When removing runway markings, apply the same treatment to areas between stripes or numbers, as the cleaned area will appear to pilots as a marking in the shape of the treated area.
- 2.18.2.4 If it is not possible to install threshold bars, chevrons, and arrows on the pavement, "temporary outboard white threshold bars and yellow arrowheads", see <u>Figure 2-5</u>, may be used. Locate them outside of the runway pavement surface on both sides of the runway. The dimensions must be as shown in <u>Figure 2-5</u>. If the markings are not discernible on grass or snow, apply a black background with appropriate material over the ground to ensure they are clearly visible.
- 2.18.2.5 The application rate of paint to mark a short-term temporary runway and taxiway markings may deviate from the standard (see Item P-620, "Runway and Taxiway Painting," in <u>AC 150/5370-10</u>), but the dimensions must meet the existing standards. When applying temporary markings at night, it is recommended that the fast curing, Type II paint be used to help offset the higher humidity and cooler temperatures often experienced at night. Diluting the paint will substantially increase cure time and is not recommended. Glass beads are not recommended for temporary markings. Striated markings may also be used for certain temporary markings. <u>AC</u>

<u>150/5340-1</u>, *Standards for Airport Markings*, has additional guidance on temporary markings.



Figure 2-5. Temporary Outboard White Threshold Bars and Yellow Arrowheads

2.18.3 Lighting and Visual NAVAIDs.

This paragraph refers to standard runway and taxiway lighting systems. See below for hazard lighting. Lighting installation must be in conformance with AC 150/5340-30, Design and Installation Details for Airport Visual Aids, and fixture design in conformance with AC 150/5345-50, Specification for Portable Runway and Taxiway Lights. When disconnecting runway and taxiway lighting fixtures, disconnect the associated isolation transformers. See AC 150/5340-26, Maintenance of Airport Visual Aid Facilities, for disconnect procedures and safety precautions. Alternately, cover the light fixture in such a way as to prevent light leakage. Avoid removing the lamp from energized fixtures because an excessive number of isolation transformers with open secondaries may damage the regulators and/or increase the current above its normal value. Secure, identify, and place any above ground temporary wiring in conduit to prevent electrocution and fire ignition sources. Maintain mandatory hold signs to operate normally in any situation where pilots or vehicle drivers could mistakenly be in that location. At towered airports certificated under Part 139, holding position signs are required to be illuminated on open taxiways crossing to closed or inactive runways. If the holding position sign is installed on the runway circuit for the closed runway, install a jumper to the taxiway circuit to provide power to the holding position sign for nighttime operations. Where it is not possible to maintain power to signs that would normally be operational, install barricades to exclude aircraft. Figure 2-1, Figure 2-2, Figure 2-3, and Figure 2-4 illustrate temporary changes to lighting and visual NAVAIDs.

2.18.3.1 **Permanently Closed Runways and Taxiways.**

For runways and taxiways that have been permanently closed, disconnect the lighting circuits.

2.18.3.2 Temporarily Closed Runways and New Runways Not Yet Open to Air Traffic.

If available, use a lighted X, both at night and during the day, placed at each end of the runway on or near the runway designation numbers facing the approach. (Note that the lighted X must be illuminated at all times that it is on a runway.) The use of a lighted X is required if night work requires runway lighting to be on. See <u>AC 150/5345-55</u>, *Specification for L-893*, *Lighted Visual Aid to Indicate Temporary Runway Closure*. For runways that have been temporarily closed, but for an extended period, and for those with pilot controlled lighting, disconnect the lighting circuits or secure switches to prevent inadvertent activation. For runways that will be opened periodically, coordinate procedures with the FAA air traffic manager or, at airports without an ATCT, the airport operator. Activate stop bars if available. <u>Figure 2-6</u> shows a lighted X by day. <u>Figure 2-7</u> shows a lighted X at night.





Figure 2-7. Lighted X at Night



2.18.3.3 **Partially Closed Runways and Displaced Thresholds.**

When a runway is partially closed, a portion of the pavement is unavailable for any aircraft operation, meaning taxiing and landing or taking off in either direction. A displaced threshold, by contrast, is put in place to ensure obstacle clearance by landing aircraft. The pavement prior to the displaced threshold is available for takeoff in the direction of the displacement, and for landing and takeoff in the opposite direction. Misunderstanding this difference and issuance of a subsequently inaccurate NOTAM can result in a hazardous situation. For both partially closed runways and displaced thresholds, approach lighting systems at the affected end must be placed out of service.

2.18.3.3.1 <u>Partially Closed Runways.</u>

Disconnect edge and threshold lights on that part of the runway at and behind the threshold (that is, the portion of the runway that is closed). Alternately, cover the light fixtures in such a way as to prevent light leakage. See Figure 2-1.

2.18.3.3.2 <u>Temporary Displaced Thresholds.</u>

Edge lighting in the area of the displacement emits red light in the direction of approach and yellow light (white for visual runways) in the opposite direction. If the displacement is 700 feet or less, blank out centerline lights in the direction of approach or place the centerline lights out of service. If the displacement is over 700 feet, place the centerline lights out of service. See <u>AC 150/5340-30</u> for details on lighting displaced thresholds. See <u>Figure 2-2</u>.

- 2.18.3.3.3 Temporary runway thresholds and runway ends must be lighted if the runway is lighted and it is the intended threshold for night landings or instrument meteorological conditions.
- 2.18.3.3.4 A temporary threshold on an unlighted runway may be marked by retroreflective, elevated markers in addition to markings noted in paragraph 2.18.2.1.3. Markers seen by aircraft on approach are green. Markers at the rollout end of the runway are red. At certificated airports, temporary elevated threshold markers must be mounted with a frangible fitting (see 14 CFR Part 139.309). At non-certificated airports, the temporary elevated threshold markings may either be mounted with a frangible fitting or be flexible. See <u>AC 150/5345-39</u>, *Specification for L-853, Runway and Taxiway Retroreflective Markers*.
- 2.18.3.3.5 Temporary threshold lights and runway end lights and related visual NAVAIDs are installed outboard of the edges of the full-strength pavement only when they cannot be installed on the pavement. They are installed with bases at grade level or as low as possible, but not more than 3 inch (7.6 cm) above ground. (The standard above ground height for airport lighting fixtures is 14 inches (35 cm)). When any portion of a base is above grade, place properly compacted fill around the base to minimize the rate of gradient change so aircraft can, in an emergency, cross at normal landing or takeoff speeds without incurring significant damage. See <u>AC 150/5370-10</u>.
- 2.18.3.3.6 Maintain threshold and edge lighting color and spacing standards as described in <u>AC 150/5340-30</u>. Battery powered, solar, or portable lights that meet the criteria in <u>AC 150/5345-50</u> may be used. These systems are intended primarily for visual flight rules (VFR) aircraft operations but may

be used for instrument flight rules (IFR) aircraft operations, upon individual approval from the Flight Standards Division of the applicable FAA Regional Office.

- 2.18.3.3.7 When runway thresholds are temporarily displaced, reconfigure yellow lenses (caution zone), as necessary, and place the centerline lights out of service.
- 2.18.3.3.8 Relocate the Visual Glide Slope Indicator (VGSI), such as Visual Approach Slope Indicator (VASI) and Precision Approach Path Indicator (PAPI); other airport lights, such as Runway End Identifier Lights (REIL); and approach lights to identify the temporary threshold. Another option is to disable the VGSI or any equipment that would give misleading indications to pilots as to the new threshold location. Installation of temporary visual aids may be necessary to provide adequate guidance to pilots on approach to the affected runway. If the FAA owns and operates the VGSI, coordinate its installation or disabling with the local ATO/Technical Operations Office. Relocation of such visual aids will depend on the duration of the project and the benefits gained from the relocation, as this can result in great expense. See FAA JO 6850.2, *Visual Guidance Lighting Systems*, for installation criteria for FAA owned and operated NAVAIDs.
- 2.18.3.3.9 Issue a NOTAM to inform pilots of temporary lighting conditions.

2.18.3.4 **Temporarily Closed Taxiways.**

If possible, deactivate the taxiway lighting circuits. When deactivation is not possible (for example other taxiways on the same circuit are to remain open), cover the light fixture in a way as to prevent light leakage.

2.18.4 Signs.

To the extent possible, signs must be in conformance with <u>AC 150/5345-44</u>, *Specification for Runway and Taxiway Signs*, and <u>AC 150/5340-18</u>, *Standard for Airport Sign Systems*.

2.18.4.1 **Existing Signs.**

Runway exit signs are to be covered for closed runway exits. Outbound destination signs are to be covered for closed runways. Any time a sign does not serve its normal function or would provide conflicting information, it must be covered or removed to prevent misdirecting pilots. Note that information signs identifying a crossing taxiway continue to perform their normal function even if the crossing taxiway is closed. For long term construction projects, consider relocating signs, especially runway distance remaining signs.

2.18.4.2 **Temporary Signs.**

Orange construction signs comprise a message in black on an orange background. Orange construction signs may help pilots be aware of changed conditions. The airport operator may choose to introduce these signs as part of a movement area construction project to increase situational awareness when needed. Locate signs outside the taxiway safety limits and ahead of construction areas so pilots can take timely action. Use temporary signs judiciously, striking a balance between the need for information and the increase in pilot workload. When there is a concern of pilot "information overload," the applicability of mandatory hold signs must take precedence over orange construction signs recommended during construction. Temporary signs must meet the standards for such signs in Engineering Brief 93, Guidance for the Assembly and Installation of Temporary Orange Construction Signs. Many criteria in AC 150/5345-44, Specification for Runway and Taxiway Signs, are referenced in the Engineering Brief. Permissible sign legends are:

- 1. CONSTRUCTION AHEAD,
- 2. CONSTRUCTION ON RAMP, and
- 3. RWY XX TAKEOFF RUN AVAILABLE XXX FT.

Phasing, supported by drawings and sign schedule, for the installation of orange construction signs must be included in the CSPP or SPCD.

2.18.4.2.1 <u>Takeoff Run Available (TORA) signs.</u>

Recommended: Where a runway has been shortened for takeoff, install orange TORA signs well before the hold lines, such as on a parallel taxiway prior to a turn to a runway hold position. See EB 93 for sign size and location.

2.18.4.2.2 Sign legends are shown in <u>Figure F-1</u>.

Note: See Figure E-1, Figure E-2, Figure E-3, Figure F-2, and Figure F-3 for examples of orange construction sign locations.

2.19 Marking and Signs for Access Routes.

The CSPP should indicate that pavement markings and signs for construction personnel will conform to <u>AC 150/5340-18</u> and, to the extent practicable, with the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) and/or State highway specifications. Signs adjacent to areas used by aircraft must comply with the frangibility requirements of <u>AC 150/5220-23</u>, *Frangible Connections*, which may require modification to size and height guidance in the MUTCD.

2.20 Hazard Marking, Lighting and Signing.

2.20.1 Hazard marking, lighting, and signing prevent pilots from entering areas closed to aircraft, and prevent construction personnel from entering areas open to aircraft. The CSPP must specify prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles. Hazard marking and lighting must also be specified to identify open manholes, small areas under repair, stockpiled material, waste areas, and areas subject to jet blast. Also consider less obvious construction-related hazards and include markings to identify FAA, airport, and National Weather Service facilities cables and power lines; instrument landing system (ILS) critical areas; airport surfaces, such as RSA, OFA, and OFZ; and other sensitive areas to make it easier for contractor personnel to avoid these areas.

2.20.2 Equipment.

2.20.2.1 Barricades.

Low profile barricades, including traffic cones, (weighted or sturdily attached to the surface) are acceptable methods used to identify and define the limits of construction and hazardous areas on airports. Careful consideration must be given to selecting equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast. The spacing of barricades must be such that a breach is physically prevented barring a deliberate act. For example, if barricades are intended to exclude aircraft, gaps between barricades must be smaller than the wingspan of the smallest aircraft to be excluded; if barricades are intended to exclude vehicles, gaps between barricades must be smaller than the width of the excluded vehicles, generally 4 feet (1.2 meters). Provision must be made for ARFF access if necessary. If barricades are intended to exclude pedestrians, they must be continuously linked. Continuous linking may be accomplished through the use of ropes, securely attached to prevent FOD.

2.20.2.2 Lights.

Lights must be red, either steady burning or flashing, and must meet the luminance requirements of the State Highway Department. Batteries powering lights will last longer if lights flash. Lights must be mounted on barricades and spaced at no more than 10 feet (3 meters). Lights must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the contractor turn them on manually during periods of low visibility during daytime hours.

2.20.2.3 **Supplement Barricades with Signs (for example) As Necessary.** Examples are "No Entry" and "No Vehicles." Be aware of the increased effects of wind and jet blast on barricades with attached signs.

2.20.2.4 Air Operations Area – General.

Barricades are not permitted in any active safety area or on the runway side of a runway hold line. Within a runway or taxiway object free area, and on aprons, use orange traffic cones, flashing or steady burning red lights as noted above, highly reflective collapsible barricades marked with diagonal, alternating orange and white stripes; and/or signs to separate all construction/maintenance areas from the movement area. Barricades may be supplemented with alternating orange and white flags at least 20 by 20 inch (50 by 50 cm) square and securely fastened to eliminate FOD. All barricades adjacent to any open runway or taxiway / taxilane safety area, or apron must be as low as possible to the ground, and no more than 18 inches high, exclusive of supplementary lights and flags. Barricades must be of low mass; easily collapsible upon contact with an aircraft or any of its components; and weighted or sturdily attached to the surface to prevent displacement from prop wash, jet blast, wing vortex, and other surface wind currents. If affixed to the surface, they must be frangible at grade level or as low as possible, but not to exceed 3 inch (7.6 cm) above the ground. Figure 2-8 and Figure 2-9 show sample barricades with proper coloring and flags.

Figure 2-8. Interlocking Barricades


Figure 2-9. Low Profile Barricades



2.20.2.5 Air Operations Area – Runway/Taxiway Intersections.

Use highly reflective barricades with lights to close taxiways leading to closed runways. Evaluate all operating factors when determining how to mark temporary closures that can last from 10 to 15 minutes to a much longer period of time. However, even for closures of relatively short duration, close all taxiway/runway intersections with barricades. The use of traffic cones is appropriate for short duration closures.

2.20.2.6 Air Operations Area – Other.

Beyond runway and taxiway object free areas and aprons, barricades intended for construction vehicles and personnel may be many different shapes and made from various materials, including railroad ties, sawhorses, jersey barriers, or barrels.

2.20.2.7 Maintenance.

The construction specifications must include a provision requiring the contractor to have a person on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades. The contractor must file the contact person's information with the airport operator. Lighting should be checked for proper operation at least once per day, preferably at dusk.

2.21 Work Zone Lighting for Nighttime Construction.

Lighting equipment must adequately illuminate the work area if the construction is to be performed during nighttime hours. Refer to <u>AC 150/5370-10</u> for minimum illumination levels for nighttime paving projects. Additionally, it is recommended that all support equipment, except haul trucks, be equipped with artificial illumination to safely

illuminate the area immediately surrounding their work areas. The lights should be positioned to provide the most natural color illumination and contrast with a minimum of shadows. The spacing must be determined by trial. Light towers should be positioned and adjusted to aim away from ATCT cabs and active runways to prevent blinding effects. Shielding may be necessary. Light towers should be removed from the construction site when the area is reopened to aircraft operations. Construction lighting units should be identified and generally located on the construction phasing plans in relationship to the ATCT and active runways and taxiways.

2.22 **Protection of Runway and Taxiway Safety Areas.**

Runway and taxiway safety areas, OFZs, OFAs, and approach surfaces are described in <u>AC 150/5300-13</u>. Protection of these areas includes limitations on the location and height of equipment and stockpiled material. An FAA airspace study may be required. Coordinate with the appropriate FAA Airports Regional or District Office if there is any doubt as to requirements or dimensions (see paragraph <u>2.13.5</u>) as soon as the location and height of materials or equipment are known. The CSPP should include drawings showing all safety areas, object free areas, obstacle free zones and approach departure surfaces affected by construction.

2.22.1 Runway Safety Area (RSA).

A runway safety area is the defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway (see <u>AC 150/5300-13</u>). Construction activities within the existing RSA are subject to the following conditions:

- 2.22.1.1 No construction may occur within the existing RSA while the runway is open for aircraft operations. The RSA dimensions may be temporarily adjusted if the runway is restricted to aircraft operations requiring an RSA that is equal to the RSA width and length beyond the runway ends available during construction. (See <u>AC 150/5300-13</u>). The temporary use of declared distances and/or partial runway closures may provide the necessary RSA under certain circumstances. Coordinate with the appropriate FAA Airports Regional or District Office to have declared distances information published, and appropriate NOTAMs issued. See <u>AC 150/5300-13</u> for guidance on the use of declared distances.
- 2.22.1.2 The airport operator must coordinate the adjustment of RSA dimensions as permitted above with the appropriate FAA Airports Regional or District Office and the local FAA air traffic manager and issue a NOTAM.
- 2.22.1.3 The CSPP and SPCD must provide procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations.

2.22.1.4 Excavations.

- 2.22.1.4.1 Open trenches or excavations are not permitted within the RSA while the runway is open. Backfill trenches before the runway is opened. If backfilling excavations before the runway must be opened is impracticable, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the runway across the trench without damage to the aircraft.
- 2.22.1.4.2 Construction contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

2.22.1.5 **Erosion Control.**

Soil erosion must be controlled to maintain RSA standards, that is, the RSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and fire fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.

2.22.2 Runway Object Free Area (ROFA).

Construction, including excavations, may be permitted in the ROFA. However, equipment must be removed from the ROFA when not in use, and material should not be stockpiled in the ROFA if not necessary. Stockpiling material in the OFA requires submittal of a 7460-1 form and justification provided to the appropriate FAA Airports Regional or District Office for approval.

2.22.3 <u>Taxiway Safety Area (TSA).</u>

- 2.22.3.1 A taxiway safety area is a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway. (See <u>AC 150/5300-13</u>.) Since the width of the TSA is equal to the wingspan of the design aircraft, no construction may occur within the TSA while the taxiway is open for aircraft operations. The TSA dimensions may be temporarily adjusted if the taxiway is restricted to aircraft operations requiring a TSA that is equal to the TSA width available during construction. Give special consideration to TSA dimensions at taxiway turns and intersections. (see <u>AC 150/5300-13</u>).
- 2.22.3.2 The airport operator must coordinate the adjustment of the TSA width as permitted above with the appropriate FAA Airports Regional or District Office and the FAA air traffic manager and issue a NOTAM.

2.22.3.3 The CSPP and SPCD must provide procedures for ensuring adequate distance for protection from blasting operations.

2.22.3.4 Excavations.

- 1. Curves. Open trenches or excavations are not permitted within the TSA while the taxiway is open. Trenches should be backfilled before the taxiway is opened. If backfilling excavations before the taxiway must be opened is impracticable, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the taxiway across the trench without damage to the aircraft.
- 2. Straight Sections. Open trenches or excavations are not permitted within the TSA while the taxiway is open for unrestricted aircraft operations. Trenches should be backfilled before the taxiway is opened. If backfilling excavations before the taxiway must be opened is impracticable, cover the excavations to allow the safe passage of ARFF equipment and of the heaviest aircraft operating on the taxiway across the trench without causing damage to the equipment or aircraft. In rare circumstances where the section of taxiway is indispensable for aircraft movement, open trenches or excavations may be permitted in the TSA while the taxiway is open to aircraft operations, subject to the following restrictions:
 - a. Taxiing speed is limited to 10 mph.
 - b. Appropriate NOTAMs are issued.
 - c. Marking and lighting meeting the provisions of paragraphs 2.18 and 2.20 are implemented.
 - d. Low mass, low-profile lighted barricades are installed.
 - e. Appropriate temporary orange construction signs are installed.
- 3. Construction contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

2.22.3.5 **Erosion control.**

Soil erosion must be controlled to maintain TSA standards, that is, the TSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.

2.22.4 Taxiway Object Free Area (TOFA).

Unlike the Runway Object Free Area, aircraft wings regularly penetrate the taxiway object free area during normal operations. Thus, the restrictions are more stringent. Except as provided below, no construction may occur within the taxiway object free area while the taxiway is open for aircraft operations.

- 2.22.4.1 The taxiway object free area dimensions may be temporarily adjusted if the taxiway is restricted to aircraft operations requiring a taxiway object free area that is equal to the taxiway object free area width available. Give special consideration to TOFA dimensions at taxiway turns and intersections.
- 2.22.4.2 Offset taxiway centerline and edge pavement markings (do not use glass beads) may be used as a temporary measure to provide the required taxiway object free area. Where offset taxiway pavement markings are provided, centerline lighting, centerline reflectors, or taxiway edge reflectors are required. Existing lighting that does not coincide with the temporary markings must be taken out of service.
- 2.22.4.3 Construction activity, including open excavations, may be accomplished without adjusting the width of the taxiway object free area, subject to the following restrictions:
- 2.22.4.3.1 Taxiing speed is limited to 10 mph.
- 2.22.4.3.2 NOTAMs issued advising taxiing pilots of hazard and recommending reduced taxiing speeds on the taxiway.
- 2.22.4.3.3 Marking and lighting meeting the provisions of paragraphs <u>2.18</u> and <u>2.20</u> are implemented.
- 2.22.4.3.4 If desired, appropriate orange construction signs are installed. See paragraph <u>2.18.4.2</u> and <u>Appendix F</u>.
- 2.22.4.3.5 Five-foot clearance is maintained between equipment and materials and any part of an aircraft (includes wingtip overhang). If such clearance can only be maintained if an aircraft does not have full use of the entire taxiway width (with its main landing gear at the edge of the usable pavement), then it will be necessary to move personnel and equipment for the passage of that aircraft.
- 2.22.4.3.6 Flaggers furnished by the contractor must be used to direct and control construction equipment and personnel to a pre-established setback distance for safe passage of aircraft, and airline and/or airport personnel. Flaggers must also be used to direct taxiing aircraft. Due to liability issues, the airport operator should require airlines to provide flaggers for directing taxiing aircraft.

2.22.5 Obstacle Free Zone (OFZ).

In general, personnel, material, and/or equipment may not penetrate the OFZ while the runway is open for aircraft operations. If a penetration to the OFZ is necessary, it may be possible to continue aircraft operations through operational restrictions. Coordinate with the FAA through the appropriate FAA Airports Regional or District Office.

2.22.6 <u>Runway Approach/Departure Areas and Clearways.</u>

All personnel, materials, and/or equipment must remain clear of the applicable threshold siting surfaces, as defined in <u>AC 150/5300-13</u>. Objects that do not penetrate these surfaces may still be obstructions to air navigation and may affect standard instrument approach procedures. Coordinate with the FAA through the appropriate FAA Airports Regional or District Office.

2.22.6.1 Construction activity in a runway approach/departure area may result in the need to partially close a runway or displace the existing runway threshold. Partial runway closure, displacement of the runway threshold, as well as closure of the complete runway and other portions of the movement area also require coordination through the airport operator with the appropriate FAA air traffic manager (FSS if non-towered) and ATO/Technical Operations (for affected NAVAIDS) and airport users.

2.22.6.2 Caution About Partial Runway Closures.

When filing a NOTAM for a partial runway closure, clearly state that the portion of pavement located prior to the threshold is not available for landing and departing traffic. In this case, the threshold has been moved for both landing and takeoff purposes (this is different than a displaced threshold). There may be situations where the portion of closed runway is available for taxiing only. If so, the NOTAM must reflect this condition).

2.22.6.3 **Caution About Displaced Thresholds.**

Implementation of a displaced threshold affects runway length available for aircraft landing over the displacement. Depending on the reason for the displacement (to provide obstruction clearance or RSA), such a displacement may also require an adjustment in the landing distance available and accelerate-stop distance available in the opposite direction. If project scope includes personnel, equipment, excavation, or other work within the existing RSA of any usable runway end, do not implement a displaced threshold unless arrivals and departures toward the construction activity are prohibited. Instead, implement a partial closure.

2.23 **Other Limitations on Construction.**

The CSPP must specify any other limitations on construction, including but not limited to:

2.23.1 Prohibitions.

2.23.1.1	No use of tall equipment (cranes, concrete pumps, and so on) unless a
	7460-1 determination letter is issued for such equipment.

- 2.23.1.2 No use of open flame welding or torches unless fire safety precautions are provided and the airport operator has approved their use.
- 2.23.1.3 No use of electrical blasting caps on or within 1,000 feet (300 meters) of the airport property. See <u>AC 150/5370-10</u>.

2.23.2 <u>Restrictions.</u>

- 2.23.2.1 Construction suspension required during specific airport operations.
- 2.23.2.2 Areas that cannot be worked on simultaneously.
- 2.23.2.3 Day or night construction restrictions.
- 2.23.2.4 Seasonal construction restrictions.
- 2.23.2.5 Temporary signs not approved by the airport operator.
- 2.23.2.6 Grades changes that could result in unplanned effects on NAVAIDs.

CHAPTER 3. GUIDELINES FOR WRITING A CSPP

3.1 General Requirements.

The CSPP is a standalone document written to correspond with the subjects outlined in paragraph 2.4. The CSPP is organized by numbered sections corresponding to each subject listed in paragraph 2.4, and described in detail in paragraphs 2.5 - 2.23. Each section number and title in the CSPP matches the corresponding subject outlined in paragraph 2.4 (for example, 1. Coordination, 2. Phasing, 3. Areas and Operations Affected by the Construction Activity, and so on). With the exception of the project scope of work outlined in Section 2. Phasing, only subjects specific to operational safety during construction should be addressed.

3.2 **Applicability of Subjects.**

Each section should, to the extent practical, focus on the specific subject. Where an overlapping requirement spans several sections, the requirement should be explained in detail in the most applicable section. A reference to that section should be included in all other sections where the requirement may apply. For example, the requirement to protect existing underground FAA ILS cables during trenching operations could be considered FAA ATO coordination (Coordination, paragraph 2.5.3), an area and operation affected by the construction activity (Areas and Operations Affected by the Construction Activity, paragraph 2.7.1.4), a protection of a NAVAID (Protection of Navigational Aids (NAVAIDs), paragraph 2.8), or a notification to the FAA of construction activities (Notification of Construction Activities, paragraph 2.13.5.3.2). However, it is more specifically an underground utility requirement (Underground Utilities, paragraph 2.15). The procedure for protecting underground ILS cables during trenching operations should therefore be described in 2.4.2.11: "The contractor must coordinate with the local FAA System Support Center (SSC) to mark existing ILS cable routes along Runway 17-35. The ILS cables will be located by hand digging whenever the trenching operation moves within 10 feet of the cable markings." All other applicable sections should include a reference to 2.4.2.11: "ILS cables shall be identified and protected as described in 2.4.2.11" or "See 2.4.2.11 for ILS cable identification and protection requirements." Thus, the CSPP should be considered as a whole, with no need to duplicate responses to related issues.

3.3 **Graphical Representations.**

Construction safety drawings should be included in the CSPP as attachments. When other graphical representations will aid in supporting written statements, the drawings, diagrams, and/or photographs should also be attached to the CSPP. References should be made in the CSPP to each graphical attachment and may be made in multiple sections.

3.4 **Reference Documents.**

The CSPP must not incorporate a document by reference unless reproduction of the material in that document is prohibited. In that case, either copies of or a source for the referenced document must be provided to the contractor. Where this AC recommends references (e.g. as in paragraph <u>3.9</u>) the intent is to include a reference to the corresponding section in the CSPP, not to this Advisory Circular.

3.5 **Restrictions.**

The CSPP should not be considered as a project design review document. The CSPP should also avoid mention of permanent ("as-built") features such as pavements, markings, signs, and lighting, except when such features are intended to aid in maintaining operational safety during the construction.

3.6 **Coordination.**

Include in this section a detailed description of conferences and meetings to be held both before and during the project. Include appropriate information from <u>AC 150/5370-12</u>. Discuss coordination procedures and schedules for each required FAA ATO Technical Operations shutdown and restart and all required flight inspections.

3.7 Phasing.

Include in this section a detailed scope of work description for the project as a whole and each phase of work covered by the CSPP. This includes all locations and durations of the work proposed. Attach drawings to graphically support the written scope of work. Detail in this section the sequenced phases of the proposed construction. Include a reference to paragraph <u>3.8</u>, as appropriate.

3.8 Areas and Operations Affected by Construction.

Focus in this section on identifying the areas and operations affected by the construction. Describe corresponding mitigation that is not covered in detail elsewhere in the CSPP. Include references to paragraphs below as appropriate. Attach drawings as necessary to graphically describe affected areas and mechanisms proposed. See <u>Appendix F</u> for sample operational effects tables and figures.

3.9 NAVAID Protection.

List in this section all NAVAID facilities that will be affected by the construction. Identify NAVAID facilities that will be placed out of service at any time prior to or during construction activities. Identify individuals responsible for coordinating each shutdown and when each facility will be out of service. Include a reference to paragraph <u>3.6 for FAA ATO NAVAID shutdown, restart, and flight inspection coordination.</u> Outline in detail procedures to protect each NAVAID facility remaining in service from interference by construction activities. Include a reference to paragraph <u>3.14 for the</u> issuance of NOTAMs as required. Include a reference to paragraph 3.16 for the protection of underground cables and piping serving NAVAIDs. If temporary visual aids are proposed to replace or supplement existing facilities, include a reference to paragraph 3.19. Attach drawings to graphically indicate the affected NAVAIDS and the corresponding critical areas.

3.10 Contractor Access.

This will necessarily be the most extensive section of the CSPP. Provide sufficient detail so that a contractor not experienced in working on airports will understand the unique restrictions such work will require. Due to this extent, it should be broken down into subsections as described below:

3.10.1 Location of Stockpiled Construction Materials.

Describe in this section specific locations for stockpiling material. Note any height restrictions on stockpiles. Include a reference to paragraph 3.21 for hazard marking and lighting devices used to identify stockpiles. Include a reference to paragraph 3.11 for provisions to prevent stockpile material from becoming wildlife attractants. Include a reference to paragraph 3.12 for provisions to prevent stockpile material from becoming FOD. Attach drawings to graphically indicate the stockpile locations.

3.10.2 Vehicle and Pedestrian Operations.

While there are many items to be addressed in this major subsection of the CSPP, all are concerned with one main issue: keeping people and vehicles from areas of the airport where they don't belong. This includes preventing unauthorized entry to the AOA and preventing the improper movement of pedestrians or vehicles on the airport. In this section, focus on mechanisms to prevent construction vehicles and workers traveling to and from the worksite from unauthorized entry into movement areas. Specify locations of parking for both employee vehicles and construction equipment, and routes for access and haul roads. In most cases, this will best be accomplished by attaching a drawing. Quote from AC 150/5210-5 specific requirements for contractor vehicles rather than referring to the AC as a whole, and include special requirements for identifying HAZMAT vehicles. Quote from, rather than incorporate by reference, AC 150/5210-20 as appropriate to address the airport's rules for ground vehicle operations, including its training program. Discuss the airport's recordkeeping system listing authorized vehicle operators.

3.10.3 <u>Two-Way Radio Communications.</u>

Include a special section to identify all individuals who are required to maintain communications with Air Traffic (AT) at airports with active towers, or monitor CTAF at airports without or with closed ATCT. Include training requirements for all individuals required to communicate with AT. Individuals required to monitor AT frequencies should also be identified. If construction employees are also required to communicate by radio with Airport Operations, this procedure should be described in detail. Usage of vehicle mounted radios and/or portable radios should be addressed. Communication procedures for the event of disabled radio communication (that is, light signals, telephone numbers, others) must be included. All radio frequencies should by identified (Tower, Ground Control, CTAF, UNICOM, ATIS, and so on).

3.10.4 <u>Airport Security.</u>

Address security as it applies to vehicle and pedestrian operations. Discuss TSA requirements, security badging requirements, perimeter fence integrity, gate security, and other needs. Attach drawings to graphically indicate secured and/or Security Identification Display Areas (SIDA), perimeter fencing, and available access points.

3.11 Wildlife Management.

Discuss in this section wildlife management procedures. Describe the maintenance of existing wildlife mitigation devices, such as perimeter fences, and procedures to limit wildlife attractants. Include procedures to notify Airport Operations of wildlife encounters. Include a reference to paragraph <u>3.10</u> for security (wildlife) fence integrity maintenance as required.

3.12 FOD Management.

In this section, discuss methods to control and monitor FOD: worksite housekeeping, ground vehicle tire inspections, runway sweeps, and so on. Include a reference to paragraph 3.15 for inspection requirements as required.

3.13 HAZMAT Management.

Describe in this section HAZMAT management procedures: fuel deliveries, spill recovery procedures, Safety Data Sheet (SDS), Material Safety Data Sheet (MSDS) or Product Safety Data Sheet (PSDS) availability, and other considerations. Any specific airport HAZMAT restrictions should also be identified. Include a reference to paragraph <u>3.10</u> for HAZMAT vehicle identification requirements. Quote from, rather than incorporate by reference, <u>AC 150/5320-15</u>.

3.14 Notification of Construction Activities.

List in this section the names and telephone numbers of points of contact for all parties affected by the construction project. We recommend a single list that includes all telephone numbers required under this section. Include emergency notification procedures for all representatives of all parties potentially impacted by the construction. Identify individual representatives – and at least one alternate – for each party. List both on-duty and off-duty contact information for each individual, including individuals responsible for emergency maintenance of airport construction hazard lighting and barricades. Describe procedures to coordinate immediate response to events that might adversely affect the operational safety of the airport (such as interrupted NAVAID service). Explain requirements for and the procedures for the issuance of Notices to Airmen (NOTAMs), notification to FAA required by 14 CFR Part 77 and Part 157 and in the event of affected NAVAIDs. For NOTAMs, identify an individual, and at least one alternate, responsible for issuing and cancelling each specific type of Notice to

Airmen (NOTAM) required. Detail notification methods for police, fire fighting, and medical emergencies. This may include 911, but should also include direct phone numbers of local police departments and nearby hospitals. Identify the E911 address of the airport and the emergency access route via haul roads to the construction site. Require the contractor to have this information available to all workers. The local Poison Control number should be listed. Procedures regarding notification of Airport Operations and/or the ARFF Department of such emergencies should be identified, as applicable. If airport radio communications are identified as a means of emergency notification of ARFF personnel, the latter including activities that affect ARFF water supplies and access roads. Identify the primary ARFF contact person and at least one alternate. If notification is to be made through Airport Operations, then detail this procedure. Include a method of confirmation from the ARFF department.

3.15 **Inspection Requirements.**

Describe in this section inspection requirements to ensure airfield safety compliance. Include a requirement for routine inspections by the resident engineer (RE) or other airport operator's representative and the construction contractors. If the engineering consultants and/or contractors have a Safety Officer who will conduct such inspections, identify this individual. Describe procedures for special inspections, such as those required to reopen areas for aircraft operations. Part 139 requires daily airfield inspections at certificated airports, but these may need to be more frequent when construction is in progress. Discuss the role of such inspections on areas under construction. Include a requirement to immediately remedy any deficiencies, whether caused by negligence, oversight, or project scope change.

3.16 Underground Utilities.

Explain how existing underground utilities will be located and protected. Identify each utility owner and include contact information for each company/agency in the master list. Address emergency response procedures for damaged or disrupted utilities. Include a reference to paragraph <u>3.14</u> for notification of utility owners of accidental utility disruption as required.

3.17 **Penalties.**

Describe in this section specific penalties imposed for noncompliance with airport rules and regulations, including the CSPP: SIDA violations, VPD, and others.

3.18 **Special Conditions.**

Identify any special conditions that may trigger specific safety mitigation actions outlined in this CSPP: low visibility operations, snow removal, aircraft in distress, aircraft accident, security breach, VPD, and other activities requiring construction suspension/resumption. Include a reference to paragraph <u>3.10</u> for compliance with airport safety and security measures and for radio communications as required. Include

a reference to paragraph <u>3.14</u> for emergency notification of all involved parties, including police/security, ARFF, and medical services.

3.19 Runway and Taxiway Visual Aids.

Include marking, lighting, signs, and visual NAVAIDS. Detail temporary runway and taxiway marking, lighting, signs, and visual NAVAIDs required for the construction. Discuss existing marking, lighting, signs, and visual NAVAIDs that are temporarily, altered, obliterated, or shut down. Consider non-federal facilities and address requirements for reimbursable agreements necessary for alteration of FAA facilities and for necessary flight checks. Identify temporary TORA signs or runway distance remaining signs if appropriate. Identify required temporary visual NAVAIDs such as REIL or PAPI. Quote from, rather than incorporate by reference, <u>AC 150/5340-1</u>, *Standards for Airport Markings; <u>AC 150/5340-18</u>, <i>Standards for Airport Sign Systems;* and <u>AC 150/5340-30</u>, as required. Attach drawings to graphically indicate proposed marking, lighting, signs, and visual NAVAIDs.

3.20 Marking and Signs for Access Routes.

Detail plans for marking and signs for vehicle access routes. To the extent possible, signs should be in conformance with the Federal Highway Administration MUTCD and/or State highway specifications, not hand lettered. Detail any modifications to the guidance in the MUTCD necessary to meet frangibility/height requirements.

3.21 Hazard Marking and Lighting.

Specify all marking and lighting equipment, including when and where each type of device is to be used. Specify maximum gaps between barricades and the maximum spacing of hazard lighting. Identify one individual and at least one alternate responsible for maintenance of hazard marking and lighting equipment in the master telephone list. Include a reference to paragraph <u>3.14</u>. Attach drawings to graphically indicate the placement of hazard marking and lighting equipment.

3.22 Work Zone Lighting for Nighttime Construction.

If work is to be conducted at night, specify all lighting equipment, including when and where each type of device is to be used. Indicate the direction lights are to be aimed and any directions that aiming of lights is prohibited. Specify any shielding necessary in instances where aiming is not sufficient to prevent interference with air traffic control and aircraft operations. Attach drawings to graphically indicate the placement and aiming of lighting equipment. Where the plan only indicates directions that aiming of lights is prohibited, the placement and positioning of portable lights must be proposed by the Contractor and approved by the airport operator's representative each time lights are relocated or repositioned.

3.23 **Protection of Runway and Taxiway Safety Areas.**

This section should focus exclusively on procedures for protecting all safety areas, including those altered by the construction: methods of demarcation, limit of access, movement within safety areas, stockpiling and trenching restrictions, and so on. Reference AC 150/5300-13, as required. Include a reference to paragraph 3.10 for procedures regarding vehicle and personnel movement within safety areas. Include a reference to paragraph 3.10 for material stockpile restrictions as required. Detail requirements for trenching, excavations, and backfill. Include a reference to paragraph 3.21 for hazard marking and lighting devices used to identify open excavations as required. If runway and taxiway closures are proposed to protect safety areas, or if temporary displaced thresholds and/or revised declared distances are used to provide the required Runway Safety Area, include a reference to paragraphs 3.14 and 3.19. Detail procedures for protecting the runway OFZ, runway OFA, taxiway OFA and runway approach surfaces including those altered by the construction: methods of demarcation, limit of cranes, storage of equipment, and so on. Quote from, rather than incorporate by reference, AC 150/5300-13, as required. Include a reference to paragraph 3.24 for height (i.e., crane) restrictions as required. One way to address the height of equipment that will move during the project is to establish a three-dimensional "box" within which equipment will be confined that can be studied as a single object. Attach drawings to graphically indicate the safety area, OFZ, and OFA boundaries.

3.24 **Other Limitations on Construction.**

This section should describe what limitations must be applied to each area of work and when each limitation will be applied: limitations due to airport operations, height (i.e., crane) restrictions, areas which cannot be worked at simultaneously, day/night work restrictions, winter construction, and other limitations. Include a reference to paragraph 3.7 for project phasing requirements based on construction limitations as required.

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APPENDIX A. RELATED READING MATERIAL

Obtain the latest version of the following free publications from the FAA on its Web site at <u>http://www.faa.gov/airports/</u>.

Number	Title and Description
AC 150/5200-28	Notices to Airmen (NOTAMs) for Airport Operators
	Guidance for using the NOTAM System in airport reporting.
<u>AC 150/5200-30</u>	Airport Field Condition Assessments and Winter Operations Safety
	Guidance for airport owners/operators on the development of an acceptable airport snow and ice control program and on appropriate field condition reporting procedures.
<u>AC 150/5200-33</u>	Hazardous Wildlife Attractants On or Near Airports
	Guidance on locating certain land uses that might attract hazardous wildlife to public-use airports.
<u>AC 150/5210-5</u>	Painting, Marking, and Lighting of Vehicles Used on an Airport
	Guidance, specifications, and standards for painting, marking, and lighting vehicles operating in the airport air operations areas.
<u>AC 150/5210-20</u>	<i>Ground Vehicle Operations to include Taxiing or Towing an Aircraft on Airports</i>
	Guidance to airport operators on developing ground vehicle operation training programs.
<u>AC 150/5300-13</u>	Airport Design
	FAA standards and recommendations for airport design. Establishes approach visibility minimums as an airport design parameter, and contains the Object Free area and the obstacle free-zone criteria.
AC 150/5210-24	Airport Foreign Object Debris (FOD) Management
	Guidance for developing and managing an airport foreign object debris (FOD) program

Table A-1. FAA Publications

Number	Title and Description
<u>AC 150/5320-15</u>	Management of Airport Industrial Waste
	Basic information on the characteristics, management, and regulations of industrial wastes generated at airports. Guidance for developing a Storm Water Pollution Prevention Plan (SWPPP) that applies best management practices to eliminate, prevent, or reduce pollutants in storm water runoff with particular airport industrial activities.
<u>AC 150/5340-1</u>	Standards for Airport Markings
	FAA standards for the siting and installation of signs on airport runways and taxiways.
<u>AC 150/5340-18</u>	Standards for Airport Sign Systems
	FAA standards for the siting and installation of signs on airport runways and taxiways.
<u>AC 150/5345-28</u>	Precision Approach Path Indicator (PAPI) Systems
	FAA standards for PAPI systems, which provide pilots with visual glide slope guidance during approach for landing.
<u>AC 150/5340-30</u>	Design and Installation Details for Airport Visual Aids
	Guidance and recommendations on the installation of airport visual aids.
<u>AC 150/5345-39</u>	Specification for L-853, Runway and Taxiway Retroreflective Markers
<u>AC 150/5345-44</u>	Specification for Runway and Taxiway Signs
	FAA specifications for unlighted and lighted signs for taxiways and runways.
<u>AC 150/5345-53</u>	Airport Lighting Equipment Certification Program
	Details on the Airport Lighting Equipment Certification Program (ALECP).
<u>AC 150/5345-50</u>	Specification for Portable Runway and Taxiway Lights
	FAA standards for portable runway and taxiway lights and runway end identifier lights for temporary use to permit continued aircraft operations while all or part of a runway lighting system is inoperative.
<u>AC 150/5345-55</u>	Specification for L-893, Lighted Visual Aid to Indicate Temporary Runway Closure

Number	Title and Description
<u>AC 150/5370-10</u>	Standards for Specifying Construction of Airports
	Standards for construction of airports, including earthwork, drainage, paving, turfing, lighting, and incidental construction.
<u>AC 150/5370-12</u>	Quality Management for Federally Funded Airport Construction Projects
EB 93	<i>Guidance for the Assembly and Installation of Temporary Orange</i> <i>Construction Signs</i>
FAA Order 5200.11	FAA Airports (ARP) Safety Management System (SMS)
	Basics for implementing SMS within ARP. Includes roles and responsibilities of ARP management and staff as well as other FAA lines of business that contribute to the ARP SMS.
FAA Certalert 98-05	Grasses Attractive to Hazardous Wildlife
	Guidance on grass management and seed selection.
FAA Form 7460-1	Notice of Proposed Construction or Alteration
FAA Form 7480-1	Notice of Landing Area Proposal
FAA Form 6000.26	National NAS Strategic Interruption Service Level Agreement, Strategic Events Coordination, Airport Sponsor Form

Obtain the latest version of the following free publications from the Electronic Code of Federal Regulations at <u>http://www.ecfr.gov/</u>.

Table A-2. Code of Federal Regulation

Number	Title
Title 14 CFR Part 77	Safe, Efficient Use and Preservation of the Navigable Airspace
Title 14 CFR Part 139	Certification of Airports
Title 49 CFR Part 1542	Airport Security

Obtain the latest version of the Manual on Uniform Traffic Control Devices from the Federal Highway Administration at <u>http://mutcd.fhwa.dot.gov/</u>.

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APPENDIX B. TERMS AND ACRONYMS

Table B-1. Terms and Acronyms

Term	Definition
Form 7460-1	Notice of Proposed Construction or Alteration. For on-airport projects, the form submitted to the FAA regional or airports division office as formal written notification of any kind of construction or alteration of objects that affect navigable airspace, as defined in 14 CFR Part 77, <i>Safe, Efficient Use, and Preservation of the Navigable Airspace</i> . (See guidance available on the FAA web site at https://oeaaa.faa.gov .) The form may be downloaded at https://www.faa.gov/airports/resources/forms/ , or filed electronically at: https://www.faa.gov .
Form 7480-1	Notice of Landing Area Proposal. Form submitted to the FAA Airports Regional Division Office or Airports District Office as formal written notification whenever a project without an airport layout plan on file with the FAA involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport The form may be downloaded at <u>http://www.faa.gov/airports/resources/forms/</u> .
Form 6000-26	Airport Sponsor Strategic Event Submission Form
AC	Advisory Circular
ACSI	Airport Certification Safety Inspector
ADG	Airplane Design Group
AIP	Airport Improvement Program
ALECP	Airport Lighting Equipment Certification Program
ANG	Air National Guard
AOA	Air Operations Area, as defined in 14 CFR Part 107. Means a portion of an airport, specified in the airport security program, in which security measures are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas, and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures. This area does not include the secured area of the airport terminal building.
ARFF	Aircraft Rescue and Fire Fighting
ARP	FAA Office of Airports
ASDA	Accelerate-Stop Distance Available
AT	Air Traffic
ATCT	Airport Traffic Control Tower
ATIS	Automatic Terminal Information Service
АТО	Air Traffic Organization
Certificated Airport	An airport that has been issued an Airport Operating Certificate by the FAA under

Term	Definition
	the authority of 14 CFR Part 139, Certification of Airports.
CFR	Code of Federal Regulations
Construction	The presence of construction-related personnel, equipment, and materials in any location that could infringe upon the movement of aircraft.
CSPP	Construction Safety and Phasing Plan. The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
CTAF	Common Traffic Advisory Frequency
Displaced Threshold	A threshold that is located at a point on the runway other than the designated beginning of the runway. The portion of pavement behind a displaced threshold is available for takeoffs in either direction or landing from the opposite direction.
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FOD	Foreign Object Debris/Damage
FSS	Flight Service Station
GA	General Aviation
HAZMAT	Hazardous Materials
НМА	Hot Mix Asphalt
IAP	Instrument Approach Procedures
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LDA	Landing Distance Available
LOC	Localizer antenna array
Movement Area	The runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading aprons and aircraft parking areas (reference 14 CFR Part 139).
MSDS	Material Safety Data Sheet
MUTCD	Manual on Uniform Traffic Control Devices
NAVAID	Navigation Aid
NAVAID Critical Area	An area of defined shape and size associated with a NAVAID that must remain clear and graded to avoid interference with the electronic signal.
Non-Movement Area	The area inside the airport security fence exclusive of the Movement Area. It is important to note that the non-movement area includes pavement traversed by aircraft.

Term	Definition
NOTAM	Notices to Airmen
Obstruction	Any object/obstacle exceeding the obstruction standards specified by 14 CFR Part 77, subpart C.
OCC	Operations Control Center
OE / AAA	Obstruction Evaluation / Airport Airspace Analysis
OFA	Object Free Area. An area on the ground centered on the runway, taxiway, or taxi lane centerline provided to enhance safety of aircraft operations by having the area free of objects except for those objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. (See <u>AC 150/5300-13</u> for additional guidance on OFA standards and wingtip clearance criteria.)
OFZ	Obstacle Free Zone. The airspace below 150 ft (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches. The OFZ is subdivided as follows: Runway OFZ, Inner Approach OFZ, Inner Transitional OFZ, and Precision OFZ. Refer to <u>AC 150/5300-13</u> for guidance on OFZ.
OSHA	Occupational Safety and Health Administration
OTS	Out of Service
P&R	Planning and Requirements Group
NPI	NAS Planning & Integration
PAPI	Precision Approach Path Indicator
PFC	Passenger Facility Charge
PLASI	Pulse Light Approach Slope Indicator
Project Proposal Summary	A clear and concise description of the proposed project or change that is the object of Safety Risk Management.
RA	Reimbursable Agreement
RE	Resident Engineer
REIL	Runway End Identifier Lights
RNAV	Area Navigation
ROFA	Runway Object Free Area
RSA	Runway Safety Area. A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway, in accordance with <u>AC 150/5300-13</u> .
SDS	Safety Data Sheet
SIDA	Security Identification Display Area
SMS	Safety Management System

Term	Definition
SPCD	Safety Plan Compliance Document. Details developed and submitted by a contractor to the airport operator for approval providing details on how the performance of a construction project will comply with the CSPP.
SRM	Safety Risk Management
SSC	System Support Center
Taxiway Safety Area	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway, in accordance with <u>AC 150/5300-13</u> .
TDG	Taxiway Design Group
Temporary	Any condition that is not intended to be permanent.
Temporary Runway End	The beginning of that portion of the runway available for landing and taking off in one direction, and for landing in the other direction. Note the difference from a displaced threshold.
Threshold	The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.
TODA	Takeoff Distance Available
TOFA	Taxiway Object Free Area
TORA	Takeoff Run Available. The length of the runway less any length of runway unavailable and/or unsuitable for takeoff run computations. See <u>AC 150/5300-13</u> for guidance on declared distances.
TSA	Taxiway Safety Area, or Transportation Security Administration
UNICOM	A radio communications system of a type used at small airports.
VASI	Visual Approach Slope Indicator
VGSI	Visual Glide Slope Indicator. A device that provides a visual glide slope indicator to landing pilots. These systems include precision approach path indicator (PAPI), visual approach slope indicator (VASI), and pulse light approach slope indicator (PLASI).
VFR	Visual Flight Rules
VOR	Very High Frequency Omnidirectional Radio Range
VPD	Vehicle / Pedestrian Deviation

APPENDIX C. SAFETY AND PHASING PLAN CHECKLIST

This appendix is keyed to <u>Chapter 2</u>. In the electronic version of this AC, clicking on the paragraph designation in the Reference column will access the applicable paragraph. There may be instances where the CSPP requires provisions that are not covered by the list in this appendix.

This checklist is intended as an aid, not a required submittal.

Coordination	Reference	Addressed?		Remarks		
		Yes	No	NA		
General Considerations						
Requirements for predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction are specified.	<u>2.5</u>					
Operational safety is a standing agenda item for construction progress meetings.	<u>2.5</u>					
Scheduling of the construction phases is properly addressed.	<u>2.6</u>					
Any formal agreements are established.	<u>2.5.3</u>					
Areas and Operation	ons Affected by C	onstruction A	ctivity			
Drawings showing affected areas are included.	<u>2.7.1</u>					
Closed or partially closed runways, taxiways, and aprons are depicted on drawings.	<u>2.7.1.1</u>					
Access routes used by ARFF vehicles affected by the project are addressed.	<u>2.7.1.2</u>					
Access routes used by airport and airline support vehicles affected by the project are addressed.	2.7.1.3					
Underground utilities, including water supplies for firefighting and drainage.	2.7.1.4					

Table C-1. CSPP Checklist

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Approach/departure surfaces affected by heights of temporary objects are addressed.	<u>2.7.1.5</u>				
Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads are properly depicted on drawings.	<u>2.7.1</u>				
Temporary changes to taxi operations are addressed.	<u>2.7.2.1</u>				
Detours for ARFF and other airport vehicles are identified.	<u>2.7.2.2</u>				
Maintenance of essential utilities and underground infrastructure is addressed.	<u>2.7.2.3</u>				
Temporary changes to air traffic control procedures are addressed.	2.7.2.4				
	NAVAIDs				
Critical areas for NAVAIDs are depicted on drawings.	<u>2.8</u>				
Effects of construction activity on the performance of NAVAIDS, including unanticipated power outages, are addressed.	<u>2.8</u>				
Protection of NAVAID facilities is addressed.	<u>2.8</u>				
The required distance and direction from each NAVAID to any construction activity is depicted on drawings.	<u>2.8</u>				
Procedures for coordination with FAA ATO/Technical Operations, including identification of points of contact, are included.	<u>2.8, 2.13.1,</u> <u>2.13.5.3.1,</u> <u>2.18.1</u>				
	Contractor Acces	S			
The CSPP addresses areas to which contractor will have access and how	<u>2.9</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
the areas will be accessed.					
The application of 49 CFR Part 1542 Airport Security, where appropriate, is addressed.	<u>2.9</u>				
The location of stockpiled construction materials is depicted on drawings.	<u>2.9.1</u>				
The requirement for stockpiles in the ROFA to be approved by FAA is included.	<u>2.9.1</u>				
Requirements for proper stockpiling of materials are included.	<u>2.9.1</u>				
Construction site parking is addressed.	<u>2.9.2.1</u>				
Construction equipment parking is addressed.	<u>2.9.2.2</u>				
Access and haul roads are addressed.	<u>2.9.2.3</u>				
A requirement for marking and lighting of vehicles to comply with <u>AC 150/5210-5</u> , <i>Painting, Marking</i> <i>and Lighting of Vehicles Used on an</i> <i>Airport</i> , is included.	<u>2.9.2.4</u>				
Proper vehicle operations, including requirements for escorts, are described.	<u>2.9.2.5, 2.9.2.6</u>				
Training requirements for vehicle drivers are addressed.	<u>2.9.2.7</u>				
Two-way radio communications procedures are described.	<u>2.9.2.9</u>				
Maintenance of the secured area of the airport is addressed.	<u>2.9.2.10</u>				
Wildlife Management					
The airport operator's wildlife management procedures are addressed.	<u>2.10</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Foreign	Dbject Debris Ma	nagement			
The airport operator's FOD management procedures are addressed.	<u>2.11</u>				
Hazardo	ous Materials Mai	nagement			
The airport operator's hazardous materials management procedures are addressed.	<u>2.12</u>				
Notificatio	on of Construction	n Activities			
Procedures for the immediate notification of airport user and local FAA of any conditions adversely affecting the operational safety of the airport are detailed.	<u>2.13</u>				
Maintenance of a list by the airport operator of the responsible representatives/points of contact for all involved parties and procedures for contacting them 24 hours a day, seven days a week is specified.	<u>2.13.1</u>				
A list of local ATO/Technical Operations personnel is included.	<u>2.13.1</u>				
A list of ATCT managers on duty is included.	<u>2.13.1</u>				
A list of authorized representatives to the OCC is included.	<u>2.13.2</u>				
Procedures for coordinating, issuing, maintaining and cancelling by the airport operator of NOTAMS about airport conditions resulting from construction are included.	<u>2.8, 2.13.2,</u> <u>2.18.3.3.9</u>				
Provision of information on closed or hazardous conditions on airport movement areas by the airport operator to the OCC is specified.	2.13.2				
Emergency notification procedures for medical, fire fighting, and police	2.13.3				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
response are addressed.					
Coordination with ARFF personnel for non-emergency issues is addressed.	<u>2.13.4</u>				
Notification to the FAA under 14 CFR parts 77 and 157 is addressed.	<u>2.13.5</u>				
Reimbursable agreements for flight checks and/or design and construction for FAA owned NAVAIDs are addressed.	2.13.5.3.2				
Ins	pection Requirem	ients			
Daily and interim inspections by both the airport operator and contractor are specified.	<u>2.14.1, 2.14.2</u>				
Final inspections at certificated airports are specified when required.	<u>2.14.3</u>				
U	nderground Utilit	ties			
Procedures for protecting existing underground facilities in excavation areas are described.	<u>2.15</u>				
	Penalties				
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	<u>2.16</u>				
	Special Condition	IS		-	
Any special conditions that affect the operation of the airport or require the activation of any special procedures are addressed.	<u>2.17</u>				
Runway and Taxiway Visual Aid	Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs				
The proper securing of temporary airport markings, lighting, signs, and visual NAVAIDs is addressed.	<u>2.18.1</u>				
Frangibility of airport markings, lighting, signs, and visual NAVAIDs is specified.	<u>2.18.1, 2.18.3,</u> <u>2.18.4.2,</u> <u>2.20.2.4</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
The requirement for markings to be in compliance with <u>AC 150/5340-1</u> , <i>Standards for Airport Markings</i> , is specified.	<u>2.18.2</u>				
Detailed specifications for materials and methods for temporary markings are provided.	<u>2.18.2</u>				
The requirement for lighting to conform to <u>AC 150/5340-30</u> , <i>Design</i> and Installation Details for Airport Visual Aids; <u>AC 150/5345-50</u> , Specification for Portable Runway and Taxiway Lights; and <u>AC</u> <u>150/5345-53</u> , Airport Lighting Certification Program, is specified.	<u>2.18.3</u>				
The use of a lighted X is specified where appropriate.	<u>2.18.2.1.2,</u> <u>2.18.3.2</u>				
The requirement for signs to conform to <u>AC 150/5345-44</u> , Specification for Runway and Taxiway Signs; AC 50/5340-18, Standards for Airport Sign Systems; and <u>AC 150/5345-53</u> , Airport Lighting Certification Program, is specified.	<u>2.18.4</u>				
Marking a	and Signs For Acc	cess Routes			
The CSPP specifies that pavement markings and signs intended for construction personnel should conform to <u>AC 150/5340-18</u> and, to the extent practicable, with the MUTCD and/or State highway specifications.	<u>2.18.4.2</u>				
Hazard Marking and Lighting					
Prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles are specified.	<u>2.20.1</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Hazard marking and lighting are specified to identify open manholes, small areas under repair, stockpiled material, and waste areas.	<u>2.20.1</u>				
The CSPP considers less obvious construction-related hazards.	<u>2.20.1</u>				
Equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast is specified.	<u>2.20.2.1</u>				
The spacing of barricades is specified such that a breach is physically prevented barring a deliberate act.	<u>2.20.2.1</u>				
Red lights meeting the luminance requirements of the State Highway Department are specified.	<u>2.20.2.2</u>				
Barricades, temporary markers, and other objects placed and left in areas adjacent to any open runway, taxiway, taxi lane, or apron are specified to be as low as possible to the ground, and no more than 18 inch high.	<u>2.20.2.3</u>				
Barricades are specified to indicate construction locations in which no part of an aircraft may enter.	<u>2.20.2.3</u>				
Highly reflective barriers with lights are specified to barricade taxiways leading to closed runways.	<u>2.20.2.5</u>				
Markings for temporary closures are specified.	2.20.2.5				
The provision of a contractor's representative on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades is specified.	<u>2.20.2.7</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Work Zone Lig	hting for Nighttin	ne Constructio	on		
If work is to be conducted at night, the CSPP identifies construction lighting units and their general locations and aiming in relationship to the ATCT and active runways and taxiways.	2.21				
Protection of R	unway and Taxiw	yay Safety Are	as		Γ
The CSPP clearly states that no construction may occur within a safety area while the associated runway or taxiway is open for aircraft operations.	<u>2.22.1.1</u> , <u>2.22.3.1</u>				
The CSPP specifies that the airport operator coordinates the adjustment of RSA or TSA dimensions with the ATCT and the appropriate FAA Airports Regional or District Office and issues a local NOTAM.	<u>2.22.1.2,</u> <u>2.22.3.2</u>				
Procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations, are detailed.	<u>2.22.3.3</u>				
The CSPP specifies that open trenches or excavations are not permitted within a safety area while the associated runway or taxiway is open, subject to approved exceptions.	<u>2.22.1.4</u>				
Appropriate covering of excavations in the RSA or TSA that cannot be backfilled before the associated runway or taxiway is open is detailed.	<u>2.22.1.4</u>				
The CSPP includes provisions for prominent marking of open trenches and excavations at the construction site.	2.22.1.4				
Grading and soil erosion control to maintain RSA/TSA standards are	<u>2.22.3.5</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
addressed.					
The CSPP specifies that equipment is to be removed from the ROFA when not in use.	<u>2.22.2</u>				
The CSPP clearly states that no construction may occur within a taxiway safety area while the taxiway is open for aircraft operations.	2.22.3				
Appropriate details are specified for any construction work to be accomplished in a taxiway object free area.	<u>2.22.4</u>				
Measures to ensure that personnel, material, and/or equipment do not penetrate the OFZ or threshold siting surfaces while the runway is open for aircraft operations are included.	<u>2.22.4.3.6</u>				
Provisions for protection of runway approach/departure areas and clearways are included.	2.22.6				
Other Li	imitations on Con	struction			
The CSPP prohibits the use of open flame welding or torches unless adequate fire safety precautions are provided and the airport operator has approved their use.	<u>2.23.1.2</u>				
The CSPP prohibits the use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.	<u>2.23.1.3</u>				

APPENDIX D. CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project including information such as the date, time and name of the person conducting the inspection.

Item	Action Required (Describe)	No Action Required (Check)
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.		
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.		
Runway resurfacing projects resulting in lips exceeding 3 inch (7.6 cm) from pavement edges and ends.		
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.		
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.		
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and		

Table D-1. Potentially Hazardous Conditions

Item	Action Required (Describe)	No Action Required (Check)
approach zones.		
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.		
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.		
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.		
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.		
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.		
Obliterated or faded temporary markings on active operational areas.		
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.		

Item	Action Required (Describe)	No Action Required (Check)
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.		
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.		
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.		
Lack of radio communications with construction vehicles in airport movement areas.		
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.		
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.		
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.		
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).		

Item	Action Required (Describe)	No Action Required (Check)
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.		
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.		
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.		
Site burning, which can cause possible obscuration.		
Construction work taking place outside of designated work areas and out of phase.		
APPENDIX E. SAMPLE OPERATIONAL EFFECTS TABLE

E.1 **Project Description.**

Runway 15-33 is currently 7820 feet long, with a 500 foot stopway on the north end. This project will remove the stopway and extend the runway 1000 feet to the north and 500 feet to the south. Finally, the existing portion of the runway will be repaved. The runway 33 glide slope will be relocated. The new runway 33 localizer has already been installed by FAA Technical Operations and only needs to be switched on. Runway 15 is currently served only by a localizer, which will remain in operation as it will be beyond the future RSA. Appropriate NOTAMS will be issued throughout the project.

E.1.1 During Phase I, the runway 15 threshold will be displaced 1000 feet to keep construction equipment below the approach surface. The start of runway 15 takeoff and the departure end of runway 33 will also be moved 500 feet to protect workers from jet blast. Declared distances for runway 33 will be adjusted to provide the required RSA and applicable departure surface. Excavation near Taxiway G will require its ADG to be reduced from IV to III. See Figure E-1.



Figure E-1. Phase I Example

- **Note 1:** Where hold signs are installed on both sides of a taxiway, install the TORA sign on the left side of the taxiway before the final turn to the runway intersection.
- Note 2: Based on the declared distances for Runway 33 departures, the maximum equipment height in the construction area is 12.5 feet (500/40 = 12.5).

E.2 During Phase II, the runway 33 threshold will be displaced 1000 feet to keep construction equipment below the approach surface. The start of runway 33 takeoff and the departure end of runway 15 will also be moved 500 feet to protect workers from jet blast. Declared distances for runway 15 will be adjusted to provide the required RSA and applicable departure surface. See Figure E-2.



Figure E-2. Phase II Example

- **Note 1:** Where hold signs are installed on both sides of a taxiway, install the TORA sign on the left side of the taxiway before the final turn to the runway intersection.
- Note 2: Based on the declared distances for Runway 15 departures, the maximum equipment height in the construction area is 12.5 feet (500/40 = 12.5).

E.3 During Phase III, the existing portion of the runway will be repaved with Hot Mix Asphalt (HMA) and the runway 33 glide slope will be relocated. Construction will be accomplished between the hours of 8:00 pm and 5:00 am, during which the runway will be closed to operations.



Figure E-3. Phase III Example

Project	Runway 15-33 Extension and Repaving			
Phase	Normal (Existing)	Phase I: Extend Runway 15 End	Phase II: Extend Runway 33 End	Phase III: Repave Runway
Scope of Work	N/A	Extend Runway 15-33 1,000 ft on north end with Hot Mix Asphaltic Concrete (HMA).	Extend Runway 15-33 500 ft on south end with Hot Mix Asphaltic Concrete (HMA).	Repave existing runway with HMA Relocate Runway 33 Glide Slope
Effects of Construction Operations	N/A	Existing North 500 ft closed	Existing South 500 ft closed	Runway closed between 8:00 pm and 5:00 am Edge lighting out of service
Construction Phase	N/A	Phase I (Anticipated)	Phase II (Anticipated)	Phase III (Anticipated)
Runway 15 Average Aircraft Operations	Carrier: 52 /day GA: 26 /day Military: 11 /day	Carrier: 40 /day GA: 26 /day Military: 0 /day	Carrier: 45 /day GA: 26 /day Military: 5 /day	Carrier: 45 / day GA: 20 / day Military: 0 /day
Runway 33 Average Aircraft Operations	Carrier: 40 /day GA: 18 /day Military: 10 /day	Carrier: 30 /day GA: 18 /day Military: 0 /day	Carrier: 25 /day GA: 18 /day Military: 5 /day	Carrier: 20 /day GA: 5 /day Military: 0 /day
Runway 15-33 Aircraft Category	C-IV	C-IV	C-IV	C-IV
Runway 15 Approach Visibility Minimums	1 mile	1 mile	1 mile	1 mile
Runway 33 Approach Visibility Minimums	³ ⁄4 mile	³ ⁄4 mile	³ ⁄4 mile	1 mile

Table E-1. Operational Effects Table

Note: Proper coordination with Flight Procedures group is necessary to maintain instrument approach procedures during construction.

Proje	ct	Runway 15-33 Extension and Repaving				
Phase		Normal (Existing)	Phase I: Extend Runway 15 End	Phase II: Extend Runway 33 End	Phase III: Repave Runway	
Runway 15 TORA		7,820	7,320	8,320	9,320	
Distances TODA		7,820	7,320	8,320	9,320	
	ASDA	7,820	7,320	7,820	9,320	
	LDA	7,820	6,820	7,820	9,320	
Runway 33	TORA	7,820	7,320	8,320	9,320	
Declared Distances	TODA	7,820	7,320	8,320	9,320	
	ASDA	8,320	6,820	8,320	9,320	
LDA		7,820	6,820	7,820	9,320	
Runway 15 Approach Procedures		LOC only	LOC only	LOC only	LOC only	
		RNAV	RNAV	RNAV	RNAV	
		VOR	VOR	VOR	VOR	
Runway 33 Approach		ILS	ILS	ILS	LOC only	
		RNAV	RNAV	RNAV	RNAV	
Proced	ures	VOR	VOR	VOR	VOR	
Runwa NAVA	y 15 IDs	LOC	LOC	LOC	LOC	
Runway 33 NAVAIDs		ILS, MALSR	ILS, MALSR	ILS, MALSR	LOC, MALSR	
Taxiway G ADG		IV	III	IV	IV	
Taxiway (G TDG	4	4	4	4	
ATCT (hou	rs open)	24 hours	24 hours	24 hours	0500 - 2000	
ARFF I	ndex	D	D	D	D	

Project	Runway 15-33 Extension and Repaving			
Phase	Normal (Existing)	Phase I: Extend Runway 15 End	Phase II: Extend Runway 33 End	Phase III: Repave Runway
Special Conditions	Air National Guard (ANG) military operations	All military aircraft relocated to alternate ANG Base	Some large military aircraft relocated to alternate ANG Base	All military aircraft relocated to alternate ANG Base
Information for NOTAMs		Refer above for applicable declared distances. Taxiway G limited to 118 ft wingspan	Refer above for applicable declared distances.	Refer above for applicable declared distances. Airport closed 2000 – 0500. Runway 15 glide slope OTS.

Note: This table is one example. It may be advantageous to develop a separate table for each project phase and/or to address the operational status of the associated NAVAIDs per construction phase.

Complete the following chart for each phase to determine the area that must be protected along the runway and taxiway edges:

Table E-2. Runway	y and Taxiwa	ay Edge Protection
-------------------	--------------	--------------------

Runway/Taxiway	Aircraft Approach Category* A, B, C, or D	Airplane Design Group* I, II, III, or IV	Safety Area Width in Feet Divided by 2*

*See <u>AC 150/5300-13</u> to complete the chart for a specific runway/taxiway.

Complete the following chart for each phase to determine the area that must be protected before the runway threshold:

Runway End Number	Airplane Design Group* I, II, III, or IV	Aircraft Approach Category* A, B, C, or D	Minimum Safety Area Prior to the Threshold*	Minimum Threshold Required App	Distance to Based on proach Slope*
			ft	ft	: 1
			ft	ft	: 1
			ft	ft	: 1
			ft	ft	:1

Table E-3. Protection Prior to Runway Threshold

*See <u>AC 150/5300-13</u> to complete the chart for a specific runway.

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APPENDIX F. ORANGE CONSTRUCTION SIGNS

Figure F-1. Approved Sign Legends

CONSTRUCTION AHEAD

CONSTRUCTION ON RAMP

RWY 4L TAKEOFF RUN AVAILABLE 9,780 FT



Figure F-2. Orange Construction Sign Example 1

Note: For proper placement of signs, refer to EB 93.



Figure F-3. Orange Construction Sign Example 2

Note: For proper placement of signs, refer to EB 93.

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Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) mailing this form to Manager, Airport Engineering Division, Federal Aviation Administration ATTN: AAS-100, 800 Independence Avenue SW, Washington DC 20591 or (2) faxing it to the attention of the Office of Airport Safety and Standards at (202) 267-5383.

Subj	ect: AC 150/5370-2G	Date:	<u> </u>
Plea	ese check all appropriate line	titems:	
	An error (procedural or type	ographical) has been noted in paragraph	on page
	Recommend paragraph	on page	_ be changed as follows:
	In a future change to this A (Briefly describe what you way	C, please cover the following subject: <i>int added.)</i>	
	Other comments:		
	I would like to discuss the a	above. Please contact me at (phone num	ıber, email address).
Subr	mitted by:	Date:	

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FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

APPENDIX A

GEOTECHNICAL REPORT



Geotechnical Engineering Report

New Fuel Storage Facility

Topeka, Kansas August 2, 2022 Terracon Project No. 14215062

Prepared for:

Argus Consulting, Inc. Overland Park, Kansas

Prepared by:

Terracon Consultants, Inc. Topeka, Kansas

August 2, 2022

Argus Consulting, Inc. 6363 College Blvd., Suite 600 Overland Park, Kansas 66211



Attn: Mr. Garrett Gjerstad, P.E. – Director of Project Management

- P: (816) 874 8236
- E: ggjerstad@argusconsulting.com
- Re: Geotechnical Engineering Report New Fuel Storage Facility Topeka Regional Airport Topeka, Kansas Terracon Project No. 14215062

Dear Mr. Gjerstad:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P14215062 dated September 27, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely, Terracon Consultants, Inc.

Michael A. Snapp, P.E. Geotechnical Engineer Kansas PE: 27005



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¹Jamie M. Klein, P.E. Senior Associate Kansas PE: 22112

Terracon Consultants, Inc. 3113 SW Van Buren Street Topeka, Kansas 66611 P (785) 267 3310 F (785) 267 3382 terracon.com

REPORT TOPICS

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SITE CONDITIONS	.1
PROJECT DESCRIPTION	. 2
GEOTECHNICAL CHARACTERIZATION	. 3
GEOTECHNICAL OVERVIEW	. 4
EARTHWORK	. 5
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PAVEMENTS	14
GENERAL COMMENTS1	15
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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at <u>client.terracon.com</u>.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES SITE LOCATION AND EXPLORATION PLANS EXPLORATION RESULTS

- Boring Logs with Laboratory Data
- GeoModel
- One-dimensional Swell Result
- One-dimensional Consolidation Result
- Corrosivity Results

SUPPORTING INFORMATION

- General Notes
- Unified Soil Classification System
- Description of Rock Properties

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

New Fuel Storage Facility Topeka Regional Airport Topeka, Kansas Terracon Project No. 14215062 August 2, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed new fuel storage facility to be located at the Topeka Regional Airport in Topeka, Kansas. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and rock conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Seismic site classification per IBC
- Pavements

The geotechnical engineering Scope of Services for this project included the advancement of 9 test borings to depths ranging from approximately 16 to 20 feet below existing site grades at which auger refusal was encountered in each boring location.

Maps showing the site and boring locations are shown in the **Site Location and Exploration Plans** section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

ltem	Description
Parcel Information	The project is located at Topeka Regional Airport in Topeka, Kansas.
Existing Improvements	The general area of the project is improved with an existing airport facility which and associated pavements and infrastructure. The immediate project site is currently a vacant grass area west of the airport aprons and runways.
Existing Topography	Relatively level



PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

ltem	Description		
Information Provided	Our understanding of the project is from email correspondence with the Client and provided Site Plan (Drawing No. EX-1) dated 7/28/21.		
Project Description	 We understand the project will generally include the following improvements: Three (3) 40,000-gallon above ground fuel storage tanks with fuel weighing approximately 333,667 lbs./tank and each tank weighing an additional 93,000 lbs. (+/-). One (1) 12,000-gallon above ground fuel storage tank with fuel weighing approximately 100,100 lbs. and the tank weighting an additional 32,370 lbs. (+/-). The entire tank area (excluding future tanks) will be supported on an 8-inch thick, double reinforced concrete pad with thickened foundations underneath the tank saddles. The truck positions and access drives are typically 9-inch thick concrete pavement. 		
Site Plan			
Finished Floor Elevation (FFE)	Not provided at this time; however, we have considered all improvements will be constructed within approximately 2 feet of existing grades.		
Grading/Slopes	Unknown at this time; however, we anticipate site grading will be limited to approximately 3 feet of cut and/or fill and that permanent slopes will be no steeper than 3H:1V (Horizontal to Vertical).		
Below Grade Structures	None		
Free-Standing Retaining Walls	None		



Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation, foundations, and pavements. Detailed conditions encountered at each exploration point are indicated on the individual logs. The individual boring logs and GeoModel can be found in the **Exploration Results** section of this report. Stratification boundaries on the boring logs and GeoModel represent the approximate location of changes in stratum type; however, in situ the transition between native materials may be gradual while in existing fill changes could be abrupt.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring Number	Groundwater while Drilling		Groundwater at Completion of Drilling	
	Depth (ft.) ¹	Elevation (ft)	Depth (ft.) ¹	Elevation (ft)
B-1	13.5	1042.5	13	1043
B-2	11	1046	11	1046
B-3	15	1042	15	1042
B-4	15	1042	14.5	1042.5
B-5	11	1045	11	1045
B-6	12	1045	11.5	1045.5
B-7	9.5	1046.5	9.5	1046.5
B-8	11	1044	10.5	1044.5
B-9	16	1040	15.5	1040.5
1. Below ground surface				

The groundwater levels summarized above do not necessarily represent stable, long-term levels. Due to the low permeability of the upper cohesive soils encountered in the borings, a relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term



observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. In addition, perched water can develop over low permeability soil or rock strata. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the observations made during our subsurface exploration. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Based on the results of the subsurface exploration, laboratory tests, and our analyses, it is our opinion shallow and/or mat foundations would be feasible to support the proposed fuel storage improvements. To provide more uniform support for mat foundations and to reduce the volume change potential of the moderately expansive clays encountered at the site, we recommend the upper 24 inches of supporting subgrade consist of dense graded (KDOT AB-3 or similar) placed at densities and moisture contents indicated in the Earthwork section.

It should be noted the use of a granular zone below mat foundations may not eliminate all future subgrade volume change and resultant mat foundation movements. However, the procedures outlined should significantly reduce the potential for subgrade volume change. Additional reductions in foundation movements could be achieved by using a thicker low volume change zone.

Upon review of Google Earth imagery and Sandborn Fire Insurance Maps, an apparent structure was previously located onsite. Based upon our field exploration and soil samples, it appears that the previous structure may have had a basement which was backfilled with cohesionless (sands and gravels) soils. In addition, existing fill and possible fill materials were encountered at each boring location to depths ranging from approximately 4 to 12 feet. While the cohesive fill materials tested suggest the fill may have been placed with compactive effort and moisture control, the cohesionless soils have variable moisture contents and strengths and appears to have been placed in an uncontrolled manor. In addition, variable soil conditions could be encountered during construction to where the materials may not be suitable for support of structures and pavements. As such, we recommend the cohesionless soils (sands and gravels) be removed to full depth and to a horizontal distance of 5 feet beyond the footprint of planned improvements while cohesive soils (clays) be further evaluated by Terracon during construction as described in the **Earthwork** section of this report.

The soil samples obtained at a depth of 1 to 3 feet in Boing B-1 emanated an apparent petroleum odor, which is identified on the boring log. However, the description of an odor does not include either specifically or by implication any environmental or biological assessment of the site and



this report does not provide the identification or prevention of pollutants, hazardous materials or conditions. Terracon can provide a proposal for environmental consulting services upon request.

Existing fill should be anticipated in unexplored areas of the site, possibly to greater extents. The depth and composition of the existing fill materials can vary greatly over relatively small lateral and vertical distances. Caution should be exercised when using the depth and composition of the fill observed at the discrete boring locations for estimating purposes. Therefore, a contingency budget should be considered to provide for additional earthwork items such as moisture conditioning subgrade soils, and repairing soft subgrade soils, uncontrolled existing fill remediation, and unsuitable foundation bearing soils.

Support of foundations and pavements on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing and replacing the existing fill, but can be reduced by following the recommendations contained in this report. To take advantage of the cost benefit of not removing the existing fill, the owner must be willing to accept the risk associated with building over the existing fill following the recommended reworking of the material.

Underground utilities may be present within the project site. We recommend if any utilities are to remain in place, the associated backfill be tested by a representative of Terracon at the time of construction. For utilities which are being relocated, the resulting trenches should be over excavated and backfilled properly and tested in accordance with the recommendations in this report in section **Earthwork** or be backfilled with lean concrete or flowable fill. If lean concrete is used as backfill, the contractor should refer to all of the new build Mechanical-Electrical-Plumbing (MEP) and foundation drawings to confirm that the concrete backfill materials will not conflict with any new item installations or construction. Any abandoned underground pipes, left in place, should be fully grouted.

The recommendations presented in the following sections consider site grading, building loads and the location of the improvements are as outlined earlier within this report. Terracon should be contacted immediately if conditions are different than described as this may impact our recommendations. The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include site clearing and grubbing, subgrade preparation and fill remediation including the full depth removal of the cohesionless (sand and gravel) fill materials. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations and pavements.

Geotechnical Engineering Report

New Fuel Storage Facility Topeka, Kansas August 2, 2022 Terracon Project No. 14215062



Site Preparation

We recommend removal of all existing vegetation and organic topsoil from areas that will include at-grade construction. Stripped materials consisting of vegetation and organic materials should be stockpiled outside the work areas in order to be reused for landscaping purposes at the site. In our opinion, any cohesionless (sand and gravel) existing fill materials located within and to a horizontal distance of 5 feet beyond the footprint of planned improvements should be removed to full depth while cohesive soils (clays) be further evaluated by Terracon during construction by exploring using hand equipment or test pits, field density tests and/or possibly obtaining additional samples for further laboratory testing. If unsuitable materials are encountered at this time, these materials should be removed and replaced with controlled engineered fill.

After completion of these operations the subgrade should be proof-rolled where possible to aid in locating loose or soft areas. Proof-rolling can be performed with a loaded tandem axle dump truck. Areas that are inaccessible can be evaluated using hand equipment such as a steel T-probe, Oakfield sampler and hand penetrometer. Soft, dry and low-density soil should be removed or compacted in place prior to placing fill.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the possibility of failure along the fill/natural soil interface. Furthermore, we recommend that fill slopes be over filled and then cut back to develop an adequately compacted slope face.

Soil Stabilization

Due to the previous structure onsite and extent of fill materials, soft subgrades could be encountered even after removal of fill materials. Methods of subgrade improvement, as described below, could include scarification, moisture conditioning and recompaction, removal of unstable materials and replacement with granular fill (with or without geosynthetics). The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

Scarification and Recompaction - It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be



achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.

Crushed Stone - The use of crushed stone or crushed gravel is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below finished subgrade elevation. The use of high modulus geotextiles (i.e., engineering fabric or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the fabric or geogrid, we recommend that all below grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should not exceed 1-1/2 inches.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

Fill Material Types

Materials used for engineered fill should meet the following material property requirements:

Soil Type ¹	USCS Classification	Acceptable Locations
Lean clay, lean to fat clay and fat clay	CL, CL/CH ^{2,3} , CH ³	> 24 inches below base of the mat foundation
Low Volume Change Material ⁴	CL (LL<45 & 5 <pi<22) or GM ⁵</pi<22) 	All locations and elevations
Well graded granular	GM ⁵	All locations and elevations
Free Draining Granular Materials ⁶	GP, GW	All locations where drainage rock is required

1. Engineered fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

- By our definition, cohesive soils with a liquid limit of 46 to 49 and/or plastic index of 22 or greater are classified as lean to fat clay (with the borderline symbol CL/CH) to alert of the expansive potential of moderate plasticity clay soils (see ASTM D2487, Section 1.1, Note 1).
- 3. Delineation of moderate to high plasticity clays should be performed in the field by the geotechnical engineer or their representative and may require additional laboratory testing.
- 4. If LVC material meeting the above criteria cannot be readily obtained, an LVC soil may be developed by chemically modifying the onsite clay soils. Additional recommendations can be provided upon request if consideration is given to this method of construction.



- 5. Similar to KDOT Type AB-3, crushed limestone aggregate, limestone screenings, or other dense graded granular material containing at least 18% low plasticity fines.
- 6. Free draining granular materials with less than 5% fines should be separated from fine grained (silt or clay) subgrade soils with a geotextile fabric to limit the intrusion of fines.

Fill Compaction Requirements

Engineered fill should meet the following compaction requirements.

Item		Description
Fill Lift Thickness		9 inches or less in loose thickness when heavy, self- propelled compaction equipment is used
		4 to 6 inches in loose thickness when material is placed in confined spaces or hand-guided equipment (i.e. jumping jack or plate compactor) is used
Compaction Requirements ¹		At least 95% of the materials maximum standard Proctor dry density (ASTM D 698), or
		At least 70% of the material's maximum relative density (ASTM D4253 and D4254) for cohesionless soils
LL: Moisture Content Cohesive Soil LL-	LL≥45	Within the range of optimum moisture content to 4% above optimum moisture content as determined by the standard Proctor test during placement and compaction
	LL<45	Within the range of 2% below optimum moisture content to 2% above the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content Granular Material ²		Workable moisture levels

- We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
- 2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

Utility Trench Backfill

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath foundations, if any, should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the equipment pad. The trench should provide an effective trench plug that extends at least 5 feet from the face of the perimeter of the equipment pad. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line.



If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the structure during and after construction. Water permitted to pond next to foundation can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential foundation movements. Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained.

Exposed ground should be sloped and maintained at a minimum 10 percent away from the structures for at least 10 feet beyond the perimeter of the structure. After construction, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program.

Earthwork Construction Considerations

Shallow excavations, for the proposed structure, are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of surficial materials (vegetation topsoil), evaluation and remediation of existing fill materials, and proof-rolling and mitigation of unsuitable areas delineated by the proof-roll.



Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW AND MAT FOUNDATIONS

As previously described, shallow and/or uniformly loaded mat foundations would be feasible to support the proposed improvements provided mat foundations are supported by a minimum 24 inches of dense graded crushed rock placed over suitable soils. If the site has been prepared in accordance with the requirements noted in Earthwork, the following design parameters are applicable for shallow and mat foundations.

Shallow and Mat Foundation Design Recommendations

Based on our evaluation of the materials encountered during the subsurface exploration and the loading information described in section **Project Description**, we estimated the settlement distribution of mat foundations based on a uniformly applied contact stress distribution beneath a relatively rigid mat/superstructure system. The settlement values obtained from these analyses are based on an idealized subsurface profile and are subject to the inherent variability of the subsurface materials and the limitations of the semi-empirical methods used in the analysis. If the stress distribution or structural stiffness of the planned system varies from the conditions assumed in our analysis, Terracon should be notified.

Description	Mat Foundations	
	<u>Shallow Foundations</u> ² : stiff native soils or engineered fill extending to suitable soils ²	
Recommended bearing material ¹	Mat Foundations: 24-inches of well graded crushed limestone underlain by stiff native soils or engineered fill extending to suitable soils	
Uniform mat bearing pressure considered in analysis	750 psf	
Net allowable bearing pressure ³	2,000 psf	
Minimum embedment below finished grade ⁴	36 inches	
Approximate total cottlement ⁵	≤ 1 inch total	
Approximate total Settlement	\leq 1/2 inch differential	

Geotechnical Engineering Report

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Description	Mat Foundations	
Modulus of subgrade reaction ⁶	110 pounds per square inch per inch of deflection (psi/in. or pci) for point loading conditions	
Ultimate passive pressure ⁷	290 pcf, equivalent fluid density	
Ultimate coefficient of sliding friction ⁷	0.32	

- We recommend subgrades be maintained in a relatively moist condition until foundations are constructed. If the subgrade should become desiccated prior to construction of foundations, the affected material should be removed, or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the foundation areas, care should be taken to maintain the recommended subgrade moisture content and density until construction of the foundations.
- 2. The subgrade for floor slabs associated with structures supported by shallow foundations should have 24-inches of low volume change materials as outlined in the Earthwork section of the report.
- 3. This allowable bearing value, which would be applicable for shallow spread footings, should not be exceeded by the structural engineer's stress distribution model output, which is based on the modulus of subgrade reaction values provided herein. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the bearing elevation. Assumes any unsuitable existing fill or soft soils, if encountered, will be undercut and replaced with compacted structural fill.
- 4. The minimum embedment depth is also provided to reduce the effects of seasonal moisture variations in the subgrade soils. For perimeter footing and foundations beneath unheated areas.
- 5. The foundation settlement and resulting modulus of subgrade reaction will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the foundations, the thickness of compacted fill, and the quality of the earthwork operations. The estimated movements are based on maintaining uniform soil water content during the life of the structure.
- 6. The recommended modulus value is based on a 12-inch square plate. The modulus value used in design should be adjusted based on the actual size of the slab/mat according to the Naval Facilities Engineering Design Manual

7.2, Page 7.2-155, Table 4 equation: $K_b = K_v \left(\frac{b+1}{2b}\right)^2$ where K_v is the modulus value based on a 12-inch square plate, b is the width of the slab/mat and K_b is the design modulus value.

7. Use of passive earth pressures require the sides of the excavation for the foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the foundation forms be removed and compacted structural fill be placed against the vertical foundation face. Passive resistance in the upper 36 inches of the soil profile should be neglected.

Design Parameters – Uplift Loads

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ , of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 100 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.

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Shallow and Mat Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Concrete should be placed soon after foundation excavation to reduce bearing material disturbance. Should the materials at bearing level become excessively dry, disturbed or saturated, or frozen, the affected materials should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

Although not encountered in the borings, some surface and/or perched groundwater may enter foundation excavations during construction. It is anticipated any water entering foundation excavations from these sources can be removed using sump pumps or gravity drainage.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.





Over-excavation for structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth as shown below. The over-excavation should be backfilled up to the footing base elevation as recommended in the **Earthwork** section.



SEISMIC CONSIDERATIONS

The seismic design requirements for building and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure.

Description	Value
Seismic Site Classification ¹	D ²

1. Seismic site classification in general accordance with the International Building Code (IBC).

2. The IBC site classification considers a site profile extending to a depth of 100 feet for seismic site classification. Borings at this site were extended to a maximum depth of 20 feet. Subsurface properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Performing additional deeper borings or geophysical testing could be considered to supplement the current information. In some cases, these methods can also justify a more favorable site classification.

CORROSIVITY

Laboratory pH, water soluble sulfates, sulfides, chlorides, Red-Ox, total salts and resistivity tests was completed on soil samples recovered from Borings B-2, B-7 and B-9 to help others assess the corrosivity risk of the on-site soils. The results are provided in the **Exploration Results** section of this report. If necessary, we recommend a corrosion consultant be retained to provide specific corrosion recommendations for the project.



PAVEMENTS

General Pavement Comments

A critical aspect of pavement performance is site preparation. Pavement design considerations, noted in this section, must be applied to the site, which has been prepared as recommended in the **Earthwork** section. Pavement subgrades should be carefully evaluated as the time for pavement construction approaches. We recommend the moisture content and density of the top 8 inches of soil subgrades be evaluated and the pavement subgrades be final proofrolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Post-construction movement of pavements supported on existing fill materials cannot be accurately predicted but could be larger than normal and result in some cracking. Mitigation measures, as recommended in the **Earthwork** section are critical to the performance of pavements.

Pavement Design Considerations

We understand the truck positions and access drives will consist of 9-inch thick concrete pavements. Concrete pavements in the Topeka region typically have minimum 4,000 psi at 28 days and 5 to 7 percent air entrained that is supported by a minimum 4-inches of crushed limestone base material (KDOT AB-3 or similar).

We recommend all portland cement concrete pavement details for joint spacing, joint reinforcement (dowels), and joint sealing be prepared in accordance with applicable American Concrete Institute (ACI) guidelines. Contraction joints should be cut as soon as the slab can support the weight of a man and saw (usually 24 hours). Isolation joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base and/or subbase/subgrade section. Appropriate sub-drainage or connection to a suitable daylight outlet could be considered to remove water from the granular subbase.

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Pavement Maintenance

Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.



Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, cost estimating, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

Responsive Resourceful Reliable



EXPLORATION AND TESTING PROCEDURES

Field Exploration

The field exploration program consisted of the following:

Number of Borings	Boring Depth (feet) ¹	Location ²
7	16 to 20	Fuel Storage Tanks
2	17 to 17.5	Truck Unloading/Loading Positions

1. Below ground surface.

2. The boring locations are shown on the attached Exploration Plan

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ± 10 feet) and referencing existing site features. Approximate ground surface elevations were estimated using Google Earth. If more precise ground surface elevations and/or boring locations are desired, we recommend the borings be surveyed by a professional land surveyor.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using continuous flight solid stem augers. Three samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

We also observed and recorded groundwater levels during drilling and sampling. The groundwater levels are shown on the attached boring logs.

Our exploration team prepared field boring logs during drilling operations to record sampling depths, penetration distances, other relevant sampling information, visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent the geotechnical engineer's interpretation, and include modifications based on observations and laboratory tests.

Property Disturbance: We backfilled the borings with auger cuttings and bentonite chips after completion. Our services do not include repair of the site beyond backfilling our boreholes. Excess auger cuttings were dispersed in the general vicinity of each borehole. Because backfill material often settles below the surface after a period, we recommend boreholes be checked periodically and backfilled, if necessary.
Geotechnical Engineering Report

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Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Water content
- Unit dry weight
- Atterberg limits
- Unconfined compressive strength
- One-dimensional swell
- One-dimensional consolidation
- Corrosivity suite (pH, soluble sulfate, chloride, lab resistivity)

The laboratory testing program included examination of soil samples by an engineer or geologist. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the attached Unified Soil Classification System (USCS).

Rock classification was conducted using locally accepted practices for engineering purposes and was based on drilling characteristics and observation of disturbed samples and auger cuttings; rock core samples and petrographic analysis may reveal other rock types. Boring log rock classification was determined using the Description of Rock Properties.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan Exploration Plan (2 pages)

Note: All attachments are one page unless noted above.

SITE LOCATION PLAN New Fuel Storage Facility Topeka, Kansas August 2, 2022 Terracon Project No. 14215062





DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

New Fuel Storage Facility
Topeka, Kansas
August 2, 2022
Terracon Project No. 14215062





EXPLORATION PLAN with HISTORIC AERIAL

New Fuel Storage Facility
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August 2, 2022
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EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-9) GeoModel On-dimensional Swell Result One-dimensional Consolidation Result Corrosivity Results

Note: All attachments are one page unless noted above.

	BORING LO	DG	NO	. B	5-1				I	⊃age	1 of 1
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	LOCATION See Exploration Plan Latitude: 38.9547° Longitude: -95.6763° Approximate Surface Elev.: 1056 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIMITS
	<u>5 INCHES TOPSOIL</u> <u>1055.5+/</u> <u>FAT CLAY (CH)</u> , trace gravel, dark gray, hard, apparent petroleum odor (possible fill)	-	-		10	_	9000 (HP)	9480	20.2	106	
-	4.0 1052+/ LEAN TO FAT CLAY (CL/CH), trace gravel, dark gray, medium stiff to stiff	5-	-	X	17	3-4-4 N=8	4500 (HP)	-	27.9		
		- - 10-	-		22	-	6000 (HP)	2790	22.7	104	38-15-2
	12.0 1044+/ LEAN CLAY (CL), with gravel and rock fragments, yellow brown with gray, stiff	 15-			18	3-3-6 N=9	7000 (HP)	-	23.7		
	113.5 1040.57. 116.0 LIMESTONE, (per drillers observations) 1040+/ Auger Refusal at 16 Feet 1040.57.										
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BORING LOG NO. B-2 Page 1 of 1							1 of 1						
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2		0.3 <u>4 INCHES TOPSOIL</u> <u>FILL - LEAN TO FAT CLAY</u> , trace gravel, gray to dark gray		- - - 5-	-		11	2-3-4 N=7	7000 (HP) 4000 (HP)	3740	22.7	102	
		 <u>LEAN CLAY (CL)</u>, trace silt, gray, soft <u>12.0</u> <u>LEAN TO FAT CLAY (CL/CH)</u>, gray, brown and dark brown, medium stiff 	1050+/-	- - - - - - -		X	16	2-1-2 N=3	2500 (HP)		32.7		
3		19.0 with rock fragments	1038+/-	- 15- - -			19	2-4-4 N=8	5000 (HP)		33.6		
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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT GEO SMART LOG-NO WELL 14215062 NEW FUEL STORAGE OG GPJ TERRACON_DATATEMPLATE.GDT 8/1/22

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1		0.4 <u>5 INCHES TOPSOIL</u> <u>LEAN TO FAT CLAY (CL/CH)</u> , trace grave brown gray, stiff to hard, (possible fill)	1056.5+/ I, gray to	<u>-</u> -	-		10		9000 (HP)	11590	18.6	108	
2		dark gray to gray		- 5-	-	X	17	3-4-5 N=9	5500 (HP)		25.8		
		7.0 <u>LEAN CLAY</u> , brown to gray brown, stiff to v	<u>1050+/</u> very stiff	<u>-</u> 	-		24		6000 (HP)	4130	21.3	105	
3				10- - -	-								
		gray with yellow brown 16.5	1040.5+/	- 15-	V	X	19	3-4-5 N=9	6500 (HP)		24.6		
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1		0.4 <u>4.5 INCHES TOPSOIL</u> 105 <u>FAT CLAY (CH)</u> , trace gravel, dark brown to dark gray, medium stiff to stiff, (possible fill)	6.5+/-	_	_		10	_	9000		00.0	400	54.00.00
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				-	-		24	-	6000 (HP)	3470	25.2	101	
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1		<u>A INCHES TOPSOIL</u> <u>1055</u> <u>FILL - LEAN TO FAT CLAY</u> , trace organics and gravel, dark gray to gray	5.) 5.±/-	-								
1/22		3.0105	3+/-	_		1	9 1-2-3 N=5	3000 (HP)		24.8		
VIATEMPLATE.GDT 8/		LEAN TO FAT CLAY (CL/CH), trace gravel, dark gray to gray, stiff, (possible fill)	5	- ;- -				3000 (HP)	3710	26.7	98	
		7.0	9+/-	_								
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S NOI VALID IF S Aba	vanceme Solid ster andonme Boring ba	nt Method: n auger Method: n Auger Method: ckfilled with Auger Cuttings and/or Bentonite Method: ckfilled with Auger Cuttings and/or Bentonite	sting Pro laborator ny). ation for e ons.	y proc	es for cedure ation c	a s used of	Notes:					
		WATER LEVEL OBSERVATIONS	n Google	e ⊏arth			Boring Started: 07-11-20)22	Borin	na Comr	leted · 0	7-11-2022
							Drill Rig: CME 45		Drille	er: IPES	U	2022
	_ 11	2016 Top	6 SW 37th St Topeka, KS Project No.: 14215062									

		BORING L	OG	6 N	0.	B-	6				F	Page	1 of 1
F	PROJ	ECT: New Fuel Storage Facility	CL	IEN	T: /	Argu Over	ıs C rlan	onsulting Ind	c				
5	SITE:	Topeka Regional Airport Topeka, KS	-				iun						
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 38.9546° Longitude: -95.6763° Approximate Surface Elev.: 1057 (Ft.) + DEPTH ELEVATION (Ft	(-/ DEDTH (Et)		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits
1		0.3 <u>4 INCHES TOPSOIL</u> <u>1056.5</u> <u>1056.5</u> <u>1056.5</u> <u>1056.5</u> <u>1056.5</u> <u>1056.5</u> <u>1056.5</u>	±L=	_									
1/22		3.0	+/-	_			16	3-3-3 N=6	9000 (HP)		16.2		
1E.GD1 8/		FAT CLAY (CH), brown and gray, stiff, (possible fill)		_		1	17		4000 (HP)	2370	28.5	95	63-17-46
IATEMPLA			5	5				·					
		7.0 1050 LEAN TO FAT CLAY (CL/CH), trace silt, gray to brown gray, medium stiff	+/-	_									
GPJ TEKK			1				19	3-2-3 N=5	5000 (HP)		26.6		
ORAGE OG					$\underline{\nabla}$								
3 YFUEL STO													
15062 NEV		orange brown to gray	1	5-			18	3-3-4 N=7	3500 (HP)		30.2		
WELL 142		17.0 1040	+/-	_									
ว <mark>ุ4</mark>		17.5 LIMESTONE, (per drillers observations) 1039.5 Auger Refusal at 17.5 Feet	+/-										
PUKI. GE													
IIGINAL KE													
PAKAI EL	Str	l atification lines are approximate. In-situ, the transition may be gradual.					F	Hammer Type: Autom	atic				
ALIU IF SE	vanceme Solid ster	nt Method: See Exploration and Tes n auger description of field and I and additional data (If ar	t <mark>ing Pro</mark> aborator าy).	y proc	r <mark>es</mark> for cedure	a es used	N	otes:					
	andonme Boring ba	nt Method: ckfilled with Auger Cuttings and/or Bentonite Elevation estimated from	ion for e ns. n Google	explan e Eartl	ation o	of							
	7.	WATER LEVEL OBSERVATIONS		_			Bor	ring Started: 07-11-20	22	Borin	g Comp	leted: 0	7-11-2022
	<u> </u>	5 feet at completion	2				Dril	I Rig: CME 45		Drille	r: IPES		
SH		SW 37th St beka, KS Project No.: 14215062											

			BORING L	OG	NO	. E	8-7	,			F	² age	1 of 1
	PR	Ol	ECT: New Fuel Storage Facility	CLIE	NT:	Arg	jus orl:	Consulting Ind	;				
	SIT	ſE:	Topeka Regional Airport Topeka, KS										
		GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 38.9547° Longitude: -95.6765° Approximate Surface Elev.: 1056 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits
8/1/22			A INCHES TOPSOIL 1055.5+ FILL - LEAN TO FAT CLAY, trace organics and gravel, dark gray to dark brown	L - -	_		14	_	4000 (HP)	3340	26.3	99	
DATATEMPLATE.GDT	×		4.0 1052+ LEAN TO FAT CLAY (CL/CH), dark bluish gray to dark gray, medium stiff 7.0 1049+	<u>/-</u> 5- /-	-	X	18	2-3-4 N=7	3000 (HP)		28.9		
GE OG GPJ TERRACON	3		LEAN CLAY (CL), trace silt, gray with brown, stiff	10-			28		4000 (HP)	2780	22.9	102	
14215062 NEW FUEL STORAC	1		yellow brown with dark brown 15.5 1040.5+ 16.0 LIMESTONE, (per drillers observtions) 1040+		-	\times	18	3-5-6 N=11	6500 (HP)		21.0		
RIGINAL REPORT. GEO SMART LOG-NO WELL			Auger Refusal at 16 Feet										
PARATED FROM O		Stra	atification lines are approximate. In-situ, the transition may be gradual.					Hammer Type: Automa	atic				
G IS NOT VALID IF SEI	dvand Soli band Bori	cemer d sten onmer ng bao	nt Method: n auger Method: nt Method: ckfilled with Auger Cuttings and/or Bentonite See Exploration and Test description of field and la and additional data (If any See Supporting Informati symbols and abbreviation Elevation estimated from	ing Proce boratory p /). on for exp s. Google E	dures fo procedu lanatior arth.	or a res us	ed	Notes:					
VG LOC	_	_						Boring Started: 07-11-202	22	Borin	g Comp	leted: 0	7-11-2022
I S BORIT	$\overline{\mathbb{V}}$	9.5 9.5	between the test of test while drilling between test of t	2 V 37th St		Π		Drill Rig: CME 45		Drille	r: IPES		
0 2016 SW 37th St Topeka, KS Project No.: 14215062													

			BORIN	IG LO	DG I	NO	. В	-8				F	Page	1 of 1
	PI	ROJ	ECT: New Fuel Storage Facility		CLIE	NT:	Arg	us arla	Consulting In	с				
	S	TE:	Topeka Regional Airport Topeka, KS			·		, , ,						
MODEL 1 AVED		GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 38.9546° Longitude: -95.6767° Approximate Surface Elev.: 10	055 (Ft.) +/- ATION (Ft)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits
			FILL - GRAVEL, gray		_				-					
/1/22			3.0	1052+/		-		13	-	9000 (HP)		2.5		
LATE.GDT 8			FILL - LEAN CLAY, trace gravel, dark gray to brown		5-		X	12	4-4-5 N=9	5000 (HP)		22.3		
ACON_DATATEMPI	2		7.0 LEAN CLAY (CL), trace gravel, dark gray, soft, (possible fill)	1048+/		-								
OG.GPJ TERR					- 10-		X	3	2-1-1 N=2			25.8		
EW FUEL STORAGE (3	Ĭ	12.0 <u>LEAN TO FAT CLAY (CL/CH)</u> , yellow brown with dark brown, stiff	1043+/					245	4000				
14215062 NI	4		15.5 16.0 LIMESTONE (per drillers observations)	<u>1039.5+/</u> 1039+/	15-	-	Д	19	3-4-5 N=9	4000 (HP)		28.9		
TED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL			Auger Refusal at 16 Feet											
SEPARA	di	Str	attrication lines are approximate. In-situ, the transition may be gradual.						Hammer Type: Autom	atic				
S IS NOT VALID IF S	dva Sc ban Bc	nceme olid ster donme oring ba	nt Method: n auger Nethod: nt Method: ckfilled with Auger Cuttings and/or Bentonite Elevation estin	n and Testi field and lat data (If any g Informatic abbreviation nated from	ng Procee poratory pr). on for expl s. Google Ea	lures fo ocedur anation arth.	er a Tes use	ed	Notes:					
VG LOG	_,		WATER LEVEL OBSERVATIONS				_		Boring Started: 07-11-20	22	Borin	g Comp	leted: 0	7-11-2022
BORIN	\overline{V}	11 10	feet while drilling	266		0	Π		Drill Rig: CME 45		Drille	r: IPES		
2 10.5 feet at completion 2					SW 37th St peka, KS Project No.: 14215062									

		BORI	NG LO	DG	NO	. B	-9	I			F	Page	1 of 1
F	PROJ	ECT: New Fuel Storage Facility		CLIE	NT:	Arg	us erla	Consulting In	с				
5	SITE:	Topeka Regional Airport Topeka, KS				010	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 38.9549° Longitude: -95.6763° Approximate Surface Elev.: 1	1056 (Ft.) +/- /ATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits
1		5 INCHES TOPSOIL FILL - SAND, with clay seams, fine grained, dark brown to brown	1055.5+/	-	-		11	3-3-4 N=7			7.4		
RACON_DATATEMPLATE.GL				5	-		16				0.9		
		9.5 LEAN CLAY (CL), gray brown to orange brown, medium stiff to stiff	1046.5+/	- 10- -	-	X	19	2-3-2 N=5	5000 (HP)		21.2		
		gray to yellow brown with dark brown 16.5 17.0 LIMESTONE. (per drillers observations)	<u>1039.5+/</u> 1039+/	- 15- -	¥	X	17	3-5-6 N=11	6000 (HP)		20.2		
או בח ראטויי טרוטוויאר אברטייי גרע טוייאי רעטייע	Str	Auger Refusal at 17 Feet						Hammer Type: Autor	atic				
	vanceme Solid ster	nt Method: See Exploration of and additionary of the second secon	on and Testin f field and lab Il data (If any ng Informatio abbreviations	ng Proced looratory p). In for expl	<mark>lures</mark> fo rocedur anation	era Tesuse	ed	Notes:					
	Boring ba	ckfilled with Auger Cuttings and/or Bentonite Elevation esti	mated from (Google Ea	arth.								
WATER LEVEL OBSERVATIONS V 16 feet while drilling				Boring Started: 07-11-2022 Boring Completed: 07-11-2022									
	✓ 15.5 feet at completion				Image: CME 45 Driller: IPES 16 SW 37th St Project No.: 14215062								

GEOMODEL

New Fuel Storage Facility - Topeka, KS Terracon Project No. 14215062



✓ First Water Observation

✓ Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

Terracon

Numbers adjacent to soil column indicate depth below ground surface.





ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS ASTM D2435 - METHOD B

750 Pilot Road, Suite F Las Vegas, Nevada 89119 (702) 597-9393

Client

Argus Consulting Inc. Overland Park, KS

lerracon GeoReport

Project

New Fuel Storage Facility

Sample Submitted By: Terracon (14)

Date Received: 7/22/2022

Lab No.: 22-0515

Result	s of Corrosi	on Analysis		
Sample Number	2	3	3	
Sample Location	B-2	B-7	B-9	
Sample Depth (ft.)	3.0-5.0	8.0-10.0	8.5-10.0	
pH Analysis, ASTM G 51	7.85	7.79	7.73	
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	428	121	93	
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	
Chlorides, ASTM D 512, (mg/kg)	87	125	75	
Red-Ox, ASTM G 200, (mV)	+718	+724	+732	
Total Salts, AWWA 2520 B, (mg/kg)	1607	817	348	
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	785	1164	2037	

N. Carp

Analyzed By:

Nathan Campo Engineering Technician II

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

SUPPORTING INFORMATION

Contents:

General Notes Unified Soil Classification System Description of Rock Properties

Note: All attachments are one page unless noted above.

GENERAL NOTES – DESCRIPTION OF SYMBOLS AND ABBREVIATIONS



Sampling	Water Level		Field Tests
	Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)
Shelby Tube Split Spoon	Water Level After a Specified Period of Time	(HP)	Hand Penetrometer
Grah	Water Level After a Specified Period of Time	(T)	Torvane
Rock Core Sample	Water levels indicated on the soil boring logs	(DCP)	Dynamic Cone Penetrometer
	are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low	UC	Unconfined Compressive Strength
	permeability soils, accurate determination of groundwater levels is not possible with short	(PID)	Photo-Ionization Detector
	term water level observations.	(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

Location and Elevation Notes

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

		Strength Terr	ns						
Relative Density (More than 50% Density determined by	of Coarse Grained Soils retained on No. 200 sieve.) Standard Penetration Resistance	Consistency of Fine Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance							
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value Blows/Ft.					
Very Loose	0-3	Very Soft	less than 500	0 – 1					
Loose	4 – 9	Soft	500 to 1,000	2 – 4					
Medium Dense	10 – 29	Medium Stiff	1,000 to 2,000	4 – 8					
Dense	30 – 50	Stiff	2,000 to 4,000	8 – 15					
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 – 30					
		Hard	> 8,000	> 30					

Relative Proportions of Sand and Gravel			
Descriptive Term(s) of Percent of other constituents Dry Weight			
Trace	< 15		
With	15 – 29		
Modifier	> 30		

wouner	> 30	I
Grain Siz	ze Terminology	
Major Component of Sample	Particle Size	
Boulder	Over 12 in. (300 mm)	No
Cobbles	12 in. to 3 in. (300 mm to 75 mm)	
Gravel	3 in. to #4 sieve (4.75mm to 0.075mm)	1
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	
Silt or Clay	Passing #200 sieve (0.075 mm)	

Relative Proportions of Fines			
Descriptive Term(s) of Percent of other constituents Dry Weight			
Trace	< 5		
With	5 – 12		
Modifier	> 12		

Plasticity Description			
Term Plasticity Index			
Non-plastic	0		
Low	1 – 10		
Medium	11 – 30		
High	> 30		

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

				Soil Classification		
Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests A				ests A	Group Symbol	Group Name ^B
		Clean Gravels:	$Cu \geq 4$ and $1 \leq Cc \leq 3$ $^{\textbf{E}}$		GW	Well-graded gravel F
	Gravels: More than 50% of	Less than 5% fines ^C	Cu < 4 and/or [Cc<1 or C	c>3.0] <mark>⋿</mark>	GP	Poorly graded gravel F
	coarse fraction	Gravels with Fines:	Fines classify as ML or N	IH	GM	Silty gravel F, G, H
Coarse-Grained Soils:		More than 12% fines ^C	Fines classify as CL or C	Н	GC	Clayey gravel ^{F, G, H}
on No. 200 sieve		Clean Sands:	$Cu \ge 6$ and $1 \le Cc \le 3^{E}$		SW	Well-graded sand
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Less than 5% fines ^D	Cu < 6 and/or [Cc<1 or C	c>3.0] <mark>■</mark>	SP	Poorly graded sand
		Sands with Fines: More than 12% fines D	Fines classify as ML or N	IH	SM	Silty sand G, H, I
			Fines classify as CL or C	н	SC	Clayey sand ^{G, H, I}
		Inorgania	PI > 7 and plots on or ab	ove "A"	CL	Lean clay ^K , L, M
	Silts and Clays:	morganic.	PI < 4 or plots below "A"	ine <mark>J</mark>	ML	Silt K, L, M
	Liquid limit less than 50	Organic:	Liquid limit - oven dried	< 0.75		Organic clay K, L, M, N
Fine-Grained Soils:			Liquid limit - not dried	< 0.75	0L	Organic silt K, L, M, O
No. 200 sieve		Inorgania	PI plots on or above "A" I	ine	СН	Fat clay ^{K, L, M}
	Silts and Clays:	morganic.	Pl plots below "A" line		MH	Elastic Silt K, L, M
	Liquid limit 50 or more	Organic:	Liquid limit - oven dried	< 0.75	ОН	Organic clay K, L, M, P
			Liquid limit - not dried		011	Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily	organic matter, dark in co	olor, and organic odor		PT	Peat

A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

- ^c Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- ^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$E_{Cu} = D_{60}/D_{10}$$
 $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

F If soil contains \geq 15% sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- ^HIf fines are organic, add "with organic fines" to group name.
- If soil contains \geq 15% gravel, add "with gravel" to group name.

J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

- K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- L If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
- ^MIf soil contains \geq 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
- \mathbb{N} PI \ge 4 and plots on or above "A" line.
- PI < 4 or plots below "A" line.
- P PI plots on or above "A" line.
- QPI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES



	Weathering		
Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.		
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.		
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.		
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.		
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.		
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.		
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.		
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.		
Hardness (for engineering description of rock – not to be confused with Moh's scale for minerals)			

Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to $\frac{1}{4}$ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.

Medium Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.

Soft Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.

Very soft Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock ¹			
Spacing	Joints	Bedding/Foliation	
Less than 2 in.	Very close	Very thin	
2 in. – 1 ft.	Close	Thin	
1 ft. – 3 ft.	Moderately close	Medium	
3 ft. – 10 ft.	Wide	Thick	
More than 10 ft.	Very wide	Very thick	

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designation (RQD) ¹			Joint Openness Descriptors		
RQD, as a percentage	Diagnostic description		Openness	Descriptor	
Exceeding 90	Excellent	_	No Visible Separation	Tight	
90 – 75	Good		Less than 1/32 in.	Slightly Open	
75 – 50	Fair	_	1/32 to 1/8 in.	Moderately Open	
50 – 25	Poor		1/8 to 3/8 in.	Open	
Less than 25	Very poor		3/8 in. to 0.1 ft.	Moderately Wide	
1. RQD (given as a percenta	ge) = length of core in pieces 4		Greater than 0.1 ft.	Wide	
(-					

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. <u>Subsurface Investigation for</u> <u>Design and Construction of Foundations of Buildings.</u> New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, <u>Engineering Geology Field Manual</u>.

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

APPENDIX B

ASBESTOS AND LEAD PAINT SURVEY REPORT

Asbestos and Lead Paint Survey Report

Topeka Regional Airport – Pump Houses 6510 SE Forbes Avenue Topeka, Kansas 66619 July 22, 2022 Terracon Project No. 02217386



Prepared for: Argus Consulting Overland Park, Kansas

Prepared by: Terracon Consultants, Inc. Lenexa, Kansas



July 22, 2022

Argus Consulting 6363 College Blvd Ste 600 Overland Park, Kansas 66211-1882



Attn: Mr. Jon Jacobs Senior Fuels Specialist P: 816.874.8219 E: jjacobs@argusconsulting.com

RE: Asbestos and Lead-Based Paint Survey Topeka Regional Airport – Pump Houses 6510 SE Forbes Avenue Topeka, Kansas 66619 Terracon Project No. 02217386

Dear Mr. Jacobs:

Terracon Consultants, Inc. (Terracon) is pleased to submit the attached report for the above referenced site to Argus Consulting. The purpose of this report is to present the results of an asbestos and lead paint survey conducted on July 11, 2022. This survey was conducted in general accordance with our Proposal No. P02217386, dated September 17, 2021.

Asbestos was identified at a concentration of greater than one percent in samples collected from the following materials.

North Pump House

Material Description	Material Location	NESHAP Category	Estimated Quantity	
Exterior Caulking	Exterior at perimeter of windows, doors and between wall sections	Category II Nonfriable	600 linear feet	
White Woven Vibration Joint Cloth	Electric room SE corner on exhaust duct	Category II Nonfriable	2 square feet	
Roof Flashing Tar	Roof on roof penetrations	Category I Nonfriable	200 square feet	

South Pump House

Material Description	Material Location	NESHAP Category	Estimated Quantity
Tank Insulation	Interior small tanks below 6 vessels	RACM	120 square feet
Exterior Caulking	Exterior at perimeter of windows, doors and between wall sections	Category II Nonfriable	500 linear feet
White Woven Vibration Joint Cloth	Electric room NE corner on exhaust duct	Category II Nonfriable	2 square feet



Terracon Consultants, Inc. 15620 W 113th Street Lenexa, KS 66219 P 913-492-7777 F 913-492-7443 terracon.com

Asbestos and Lead Paint Survey Report

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Cement panels	Exterior upper soffit	Category II Nonfriable	180 square feet
Roof Flashing Tar	Roof on roof penetrations	Category I Nonfriable	150 square feet

Lead based paint (LBP) as defined by the United States Environmental Protection Agency (USEPA), and the State of Kansas, was identified in samples collected from the following surfaces.

North Pump House

- Exterior upper concrete walls green paint
- Metal window frames white/gray paint
- Metal doors and door jambs gray paint
- Electric room concrete floor gray paint
- Metal air ducts white paint
- Interior and exterior steel fuel piping silver/white

South Pump House

- Interior electric room concrete block walls gray paint
- Interior gypsum board ceilings tan paint
- Metal window frames tan paint
- Metal doors and door jambs tan/gray paint
- Interior and exterior steel fuel piping tan/white
- Exterior upper cement board soffits yellow paint

Lead containing paint as defined by the United States Occupational Safety and Health Administration (USOSHA) was identified in samples collected from the following surfaces.

North Pump House

- Interior and exterior concrete block walls white/gray/green paint
- Concrete ceilings and columns white paint
- Radiator cabinets brown paint
- Metal vessels, pumps and conduit silver paint
- Metal pump selector panels gray paint
- Exterior metal tank covers green/yellow paint

South Pump House

- Interior and exterior concrete block walls white/gray/tan paint
- Exterior upper concrete walls yellow/tan paint
- Radiator cabinets brown paint
- Metal vessels, pumps and conduit black/white/tan paint
- Metal pump control panels tan paint

Asbestos and Lead Paint Survey Report

Topeka Regional Airport – Pump Houses
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- Metal air ducts white paint
- Metal electric panels and conduit gray paint

Please refer to attached report for detailed information.

Terracon appreciates the opportunity to provide this service to Argus Consulting. If you have any questions regarding this report please contact the undersigned at 913-492-7777.

Sincerely, Terracon Consultants, Inc.

Tim Easley

TithRib

Timothy Easley Environmental Technician Mitch Reiber, PG, CIH Principal

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APPENDICES

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APPENDIX C ASBESTOS ANALYTICAL LABORATORY DATA

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- APPENDIX E LEAD ANALYTICAL LABORATORY DATA
- APPENDIX F CERTIFICATIONS/LICENSES



ASBESTOS AND LEAD PAINT SURVEY REPORT Topeka Regional Airport – Pump Houses 6510 SE Forbes Avenue Topeka, Kansas Terracon Project No. 02217386 July 22, 2022

1.0 INTRODUCTION

Terracon Consultants Inc. (Terracon) conducted an asbestos and lead paint survey of the Topeka Regional Airport pump house buildings. The survey was conducted by an AHERA accredited Asbestos Inspector and State of Kansas certified Lead Inspector in general accordance with our Proposal No. P02217386 dated September 17, 2021. Building areas were visually assessed for suspect asbestos-containing materials (ACM) and lead-based paint (LBP). Reasonable effort was made to survey accessible areas. Additional suspect materials could be present walls, in voids or in other concealed areas.

1.1 Reliance

This report is for the exclusive use of Argus Consulting for the project being discussed. Reliance by any other party on this report is prohibited without written authorization of Terracon and Argus Consulting. Reliance on this report by Argus Consulting and all authorized parties will be subject to the terms, conditions, and limitations stated in the proposal, this report and our Agreement for Services. The limitations of liability defined in our Agreement for Services is the aggregate limit of Terracon's liability to Argus Consulting.

2.0 BUILDING DESCRIPTION

There are two separate, single story pump house buildings constructed during the mid-1900's. The buildings are approximately 2,000 and 2,500 square feet. Interior floors are concrete. Walls are concrete block. The buildings have concrete roof decks.

3.0 ASBESTOS-CONTAINING MATERIAL SURVEY

The survey was conducted by Timothy Easley, a United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) accredited asbestos inspector. The asbestos inspectors' certifications are attached in Appendix E. The survey was conducted in general accordance with the sample collection protocols established in U.S. Environmental Protection Agency (EPA) 40 CFR Part 763 Subpart E 763.86, known as the AHERA. A summary of survey activities is provided below.



3.1 Visual Assessment

Survey activities were initiated with visual observation of the buildings to identify homogeneous areas of suspect ACM. A homogeneous area (HA) consists of building materials that appear similar throughout in terms of color and texture with consideration given to the date of application. The interior and exterior assessment was conducted in visually accessible areas of the buildings.

3.2 Physical Assessment

A physical assessment of each homogeneous area (HA) of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the EPA as a material that can be crumbled, pulverized or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect materials.

3.3 Sample Collection

Based on results of the visual observation, bulk samples of suspect ACM were collected in general accordance with EPA AHERA sampling protocols. Samples of suspect materials were collected from randomly selected locations in each homogeneous area. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker. The selection of sample locations and frequency of sampling were based on Terracon's observations and the assumption that like materials in the same area are homogeneous in content.

3.4 Sample Analysis

Bulk samples were submitted under chain of custody to International Asbestos Testing Laboratories of Mount Laurel, New Jersey for analysis by Polarized Light Microscopy (PLM) with dispersion staining techniques per USEPA Method 600/R-93/116. The asbestos content, where applicable, was determined by microscopic visual estimation. International Asbestos Testing Laboratories is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) Accreditation No. 101165-0.

3.5 Regulatory Overview

The Kansas Department of Health and Environment's, (KDHE) Asbestos Control Section within the Bureau of Air and Radiation, enforces the Asbestos NESAHP as adopted by reference at Kansas Administrative Regulations (K.A.R.) 28-19-735. The owner or operator must provide KDHE with written notification at least 10 working days prior to the commencement of asbestos abatement activities that will disturb RACM in amounts greater than or equal to 10 square feet or 25 linear feet.

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The asbestos NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition or

Asbestos and Lead Paint Survey Report

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renovation activity. Friable ACM is a material containing more than 1% asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. All friable ACM is considered regulated asbestos containing material (RACM).

The asbestos NESHAP regulation classifies ACM as either RACM, Category I non-friable ACM or Category II non-friable ACM. RACM includes all friable ACM, along with Category I and Category II non-friable ACM that has become friable, will be or has been subjected to sanding, grinding, cutting or abrading, or ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder during renovation or demolition activity. Category I non-friable ACM are exclusively asbestos-containing packings, gaskets, resilient floor coverings, resilient floor covering mastics and asphalt roofing products that contain more than 1% asbestos. Category II non-friable ACM are than 1% asbestos. Category II non-friable ACM generally includes but is not limited to cementitious material such as: cement pipes, cement siding, cement panels, glazing, mortar and grouts.

The United States Occupational Safety and Health Administration (USOSHA) asbestos standard for construction (29 CFR 1926.1101) regulates workplace exposure to asbestos. The USOSHA standard requires that employee exposure to airborne asbestos must not exceed 0.1 fibers per cubic centimeter of air (0.1 f/cc) as an eight-hour time weighted average (TWA) and not exceed 1.0 fibers per cubic centimeter of air (1.0 f/cc) over a 30-minute period known as an excursion limit (EL). The TWA and EL are known as USOSHA's asbestos permissible exposure limits (PELs). The USOSHA standard classifies construction and maintenance activities which could disturb ACM and specifies work practices and precautions which employers must follow when engaging in each class of regulated work. The standard also establishes requirements for handling materials containing asbestos in concentrations less than or equal to one percent.

3.6 Findings

Asbestos was identified at a concentration of greater than one percent in samples collected from the following materials.

North Pump House

Material Description	Material Location	NESHAP Category	Estimated Quantity
Exterior Caulking	Exterior at perimeter of windows, doors and between wall sections	Category II Nonfriable	600 linear feet
White Woven Vibration Joint Cloth	Electric room SE corner on exhaust duct	Category II Nonfriable	2 square feet
Roof Flashing Tar	Roof on roof penetrations	Category I Nonfriable	200 square feet



South Pump House

Material Description	Material Location	NESHAP Category	Estimated Quantity	
Tank Insulation	Interior - 6 small tanks below vessels	RACM	120 square feet	
Exterior Caulking	Exterior at perimeter of windows, doors and between wall sections	Category II Nonfriable	500 linear feet	
White Woven Vibration Joint Cloth	Electric room NE corner on exhaust duct	Category II Nonfriable	2 square feet	
Cement panels	Exterior upper soffit	Category II Nonfriable	180 square feet	
Roof Flashing Tar	Roof on roof penetrations	Category I Nonfriable	150 square feet	

The above listed RACM must be removed by a state of Kansas licensed abatement contractor prior to any activities (renovation and/or demolition) that may disturb this material in accordance with applicable federal, state and local regulations.

The above listed Category I non-friable ACM that is damaged or could be damaged to the extent that it could be crumbled, pulverized or reduced to powder when dry, making it friable, must be removed prior to any activities (renovation and/or demolition) that may disturb this material in accordance with applicable federal, state and local regulations.

The above listed Category II non-friable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder when dry, making it friable, must be properly removed prior to any activities (renovation and/or demolition) that may disturb this material in accordance with applicable federal, state and local regulations. USEPA believes that most demolition activities will subject Category II non-friable ACM to the asbestos NESHAP regulation.

Materials containing asbestos by homogenous material are presented in Appendix A. The summary of sample locations is presented in Appendix B. Laboratory analytical reports are included in Appendix C.

4.0 LEAD-BASED PAINT SURVEY

Mr. Timothy Easley, a State of Kansas licensed Lead Inspector, conducted lead-based paint (LBP) testing using an Innov-X systems, Alpha series model LBP – 4000, serial No. 11926, X-Ray Fluorescence (XRF) instrument to determine if surface coatings contain lead.

A copy of the inspector's certificate is included in Appendix F.



4.1 Visual Assessment and Sampling

The lead-based paint inspection began by visually surveying accessible building components such as walls, ceilings, floors, doors, and windows. Various paint colors were found on building surfaces. These components will be disturbed during demolition activities.

A total of 122 XRF measurements were taken from testing combinations associated with the various components listed above. Lead concentrations using an XRF are measured in milligrams per square centimeter (mg/cm²) of surface area.

Paint chip samples were collected from representative accessible surfaces to verify XRF testing results.

4.2 Sample Analysis

An Innov-X System Alpha Series X-Ray Fluorescence Spectrometer analyzed the surface coating for lead content. The instrument was used in accordance with guidelines detailed in the manufacturer's Standard Operating Procedures. Calibration checks were performed prior to and after sampling, using protocols provided by the instrument manufacturer.

Paint chip samples collected were sent with chain of custody to QuanTEM Labs in Oklahoma City, Oklahoma for analysis by Flame Atomic Absorption Method SW 846-7000B.

4.3 Lead Paint Regulatory Overview

The USEPA and the KDHE currently regulate Lead Based Paint, paint containing a lead content of 0.5% or greater of lead by weight, in "child occupied" and "targeted housing". There are currently no USEPA or KDHE regulations regarding commercial/industrial facilities. The USEPA and KDHE do regulate the disposal of lead containing materials, but only if the lead paint has been abated and is specifically disposed of as lead paint. General renovation debris and demolition debris can currently be disposed of as Construction and Demolition (C&D) debris in the State of Kansas as long as the landfill accepts these materials.

The USOSHA 29 CFR 1926.62 has established permissible limits for airborne lead concentrations in the workplace. Owners or employers conducting renovation or demolition activities which may disturb building materials containing lead (in any concentration) are required to protect their employees from airborne lead exposures exceeding the USOSHA permissible exposure limit (PEL).

USOSHA has established an "Action Level" for lead concentrations "in air" of 30 micrograms per cubic meter of air (µg/m³) and a "Permissible Exposure Limit" for lead concentrations "in air" of 50 µg/m³. Currently USOSHA has no established limits for lead content in bulk paint (non-airborne).

Asbestos and Lead Paint Survey Report

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Their interpretation on this issue is that any amount of lead may cause airborne concentrations above the established limits.

4.4 Findings

Lead based paint (LBP) is defined by the USEPA and the State of Kansas as any paint or surface coating that contains 1.0 mg/cm² or greater of lead by XRF testing or 0.5% or greater of lead by weight by laboratory analysis of paint chip samples, in "child occupied" and "targeted housing" and the USOSHA has indicated that owners or employers conducting renovation or demolition activities which may disturb building materials containing lead (in any concentration) are required to protect their employees from airborne lead exposures exceeding the USOSHA PEL.

Lead based paint (LBP) as defined by the United States Environmental Protection Agency (USEPA), and the State of Kansas, was identified in samples collected from the following surfaces.

North Pump House

- Exterior upper concrete walls green paint
- Metal window frames white/gray paint
- · Metal doors and door jambs gray paint
- Electric room concrete floor gray paint
- Metal air ducts white paint
- Interior and exterior steel fuel piping silver/white

South Pump House

- Interior electric room concrete block walls gray paint
- Interior gypsum board ceilings tan paint
- Metal window frames tan paint
- Metal doors and door jambs tan/gray paint
- Interior and exterior steel fuel piping tan/white
- Exterior upper cement board soffits yellow paint

Lead containing paint as defined by the United States Occupational Safety and Health Administration (USOSHA) was identified in samples collected from the following surfaces.

North Pump House

- Interior and exterior concrete block walls white/gray/green paint
- · Concrete ceilings and columns white paint
- Radiator cabinets brown paint
- Metal vessels, pumps and conduit silver paint
- Metal pump selector panels gray paint
- Exterior metal tank covers green/yellow paint

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South Pump House

- Interior and exterior concrete block walls white/gray/tan paint
- Exterior upper concrete walls yellow/tan paint
- Radiator cabinets brown paint
- Metal vessels, pumps and conduit black/white/tan paint
- Metal pump control panels tan paint
- Metal air ducts white paint
- Metal electric panels and conduit gray paint

The following surfaces tested were found to be at 1.0 mg/cm² lead as measured by an XRF instrument. Follow up paint chip testing and analysis of the below listed components found that the below listed paints **do not contain lead** at or above 0.5% lead by weight by laboratory analysis.

North Pump House

- Electric room concrete block walls grey paint
- Electric room concrete ceiling white paint
- Exterior metal tank covers green paint

South Pump House

Interior concrete block walls – white/gray paint

Anomalies, though rare, can occur with X-Ray Fluorescence Spectrometer paint testing, potentially giving false positive or negative results due to substrate interferences. Paint chip sampling with laboratory analysis by Flame Atomic Absorption Method SW 846-7000B is considered more definitive.

The USOSHA hazard communication requirement states that when hazardous materials (lead, asbestos, etc.) are present, employers who have employees that may disturb the hazardous materials, employers must inform their employees of the presence of such materials.

While the painted surfaces containing lead in concentrations between 0.0 and 1.0 mg/cm² do not meet the definition of lead-based paint under Housing and Urban Development (HUD), USEPA or the State of Kansas, the paint does contain lead and is subject to exposure limits under USOSHA. Therefore, it is the contractor's responsibility to make appropriate decisions concerning compliance with applicable USOSHA regulations.

Appendix D includes XRF Paint Test Results. Appendix E includes Lead Paint Laboratory Analytical Data.


5.0 GENERAL COMMENTS

Terracon did not perform sampling that required demolition or destructive activities such as knocking holes in walls, dismantling of equipment or removal of protective coverings. Reasonable efforts to access suspect materials within known areas of restricted access (e.g., crawl spaces) were made; however, confined spaces or areas which may pose a health or safety risk to Terracon personnel were not sampled. Sampling did not include suspect materials that could not be safely reached with available ladders/man-lifts.

This survey was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions and recommendations expressed in this report are based on conditions observed during Terracon's survey of the building. The information contained in this report is relevant to the date on which this survey was performed and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by Argus Consulting and is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories or other third parties supplying information that may have been used in the preparation of this report. No warranty, express or implied is made.

Topeka Regional Airport – Pump Houses Terracon Project No. 02217386 July 22, 2022 6510 SE Forbes Avenue Topeka, Kansas APPENDIX A

IDENTIFIED ASBESTOS CONTAINING MATERIALS BY HOMOGENEOUS AREA (HA)

E

North Pu	mp House					
HA No.	Material Description	Material Location	% and Type Asbestos*	NESHAP Classification	Condition	Estimated Quantity**
02	Exterior Caulking	Exterior at perimeter of windows, doors and between wall sections	PC 2.6% Chrysotile	Category II Nonfriable	Damaged	600 linear feet
04	White Woven Vibration Joint Cloth	Electric room SE corner on exhaust duct	90% Chrysotile	Category II Nonfriable	Damaged	2 square feet
06	Roof Flashing Tar	Roof on roof penetrations	PC 5.8% Chrysotile	Category I Nonfriable	Damaged	200 square feet

South Pump House

Description	Material Location	% and Type Asbestos*	NESHAP Classification	Condition	Estimated Quantity**
Insulation	Interior - 6 small tanks below vessels	15% Chrysotile	RACM	Damaged	120 square feet
or Caulking	Exterior at perimeter of windows, doors and between wall sections	PC 3.2% Chrysotile	Category II Nonfriable	Damaged	500 linear feet
oven Vibration int Cloth	Electric room NE comer on exhaust duct	90% Chrysotile	Category II Nonfriable	Damaged	2 square feet
ent panels	Exterior upper soffit	60% Chrysotile	Category II Nonfriable	Damaged	180 square feet
clashing Tar	Roof on roof penetrations	PC 5.4% Chrysotile	Category I Nonfriable	Damaged	150 square feet

*% & Type Asbestos = this column contains both the analytical result of the sample with the highest concentration of asbestos detected in the samples that make up the HA and the types of asbestos identified.

** Estimated quantities are based on a cursory field evaluation, and actual quantities may vary significantly, especially if asbestos containing materials are present in hidden and/or inaccessible areas not evaluated as part of this survey.

PC-indicates that stratified point count method of analysis was performed.

APPENDIX B Topeka Regional Airport – Pump Houses 6510 SE Forbes Avenue Topeka, Kansas

ASBESTOS SURVEY SAMPLE LOCATION SUMMARY

			North Pump House		
AH .oN	Material Description	Sample Number	Sample Location	Sample Layer	Lab Results
		01-SC1-01	North Pump House NE Corner	Off-White Glazing	None Detected
20		01-SC1-02	North Pump House SE Comer	Off-White Glazing	None Detected
5		01-SC1-02	North Pump House SE Comer	Green Glazing	None Detected
		01-SC1-03	North Pump House SW Comer	Off-White Glazing	None Detected
		02-CA1-04	North Pump House Exterior NE Corner	White Caulk	None Detected
ŝ		02-CA1-04	North Pump House Exterior NE Corner	White Glazing	PC 2.6% Chrysotile
2	Exterior caulking	02-CA1-05	North Pump House Exterior NW Corner	White Caulk	None Detected
		02-CA1-06	North Pump House Exterior SE Corner	White Glazing	PC 2.6% Chrysotile
		03-WP1-07	North Pump House NE Corner Air Handler	Brown/Silver Vibration Cloth	None Detected
03	Canvas Vibration Joint	03-WP1-08	North Pump House NE Corner Air Handler	Brown/Silver Vibration Cloth	None Detected
	1000	03-WP1-09	North Pump House NE Corner Air Handler	Brown/Silver Vibration Cloth	None Detected
	Land Contraction of the	04-WP1-10	North Pump House Electric Room	White Vibration Dampener	90% Chrysotile
64	White Woven Vibration Joint Cloth	04-WP1-11	North Pump House Electric Room	White Vibration Dampener	90% Chrysotile
		04-WP1-12	North Pump House Electric Room	White Vibration Dampener	90% Chrysotile
		05-RF1-13	North Pump House Roof NE Corner	Black Tar	None Detected
05	Tar Roofing	05-RF1-14	North Pump House Roof NW Corner	Black Roof Material	None Detected
		05-RF1-15	North Pump House Roof SE Corner	Black Tar	None Detected
		06-RF4-16	North Pump House Roof NE Corner	Black Flashing	None Detected
90	Roof Flashing Tar	06-RF4-17	North Pump House Roof NW Corner	Black Flashing	PC 5.6% Chrysotile
		06-RF4-18	North Pump House Roof SE Corner	Black Flashing	PC 5.8% Chrysotile
		A STATE OF THE ASSAULT OF THE ASSAUL			

PC - indicates stratified point count method of analysis was performed

		asuon rump mouse		
Material Description	Sample Number	Sample Location	Sample Layer	Lab Results
	01-WB2-01	South Pump House Interior Ceiling East Side	White Drywall	None Detected
Gypsum Board Ceiling	01-WB2-02	South Pump House Interior Ceiling Near Center	White Drywall	None Detected
	01-WB2-03	South Pump House Interior Ceiling West Side	White Drywall	None Detected
	02-MI3-04	South Pump House Interior South Center Vessel	Brown/Black Insulation	15% Chrysotile
Tank Insulation	02-MI3-05	South Pump House Interior North Center Vessel	Brown/Black Insulation	15% Chrysotile
	02-MI3-06	South Pump House Interior SW Vessel	Brown/Black Insulation	15% Chrysotile
	03-SC1-07	South Pump House South Side	White Glazing	None Detected
Window Glazing	03-SC1-08	South Pump House East Side	White Glazing	None Detected
1	03-SC1-09	South Pump House North Side	White Glazing	None Detected
	04-CA5-10	South Pump House Exterior North Side Window	White Caulk	PC 2.8% Chrysotile
Exterior Caulking	04-CA5-11	South Pump House Exterior West Side Door	White Caulk	PC 3.2% Chrysotile
X	04-CA5-12	South Pump House Exterior NW Corner Upper Wall	White Caulk	PC 2.6% Chrysotile
	05-WP1-13	South Pump House Electric Room North Side	Off-White Vibration Cloth	90% Chrysotile
White Woven Vibration Joint Cloth	05-WP1-14	South Pump House Electric Room North Side	Off-White Vibration Cloth	90% Chrysotile
	05-WP1-15	South Pump House Electric Room North Side	Off-White Vibration Cloth	90% Chrysotile
	06-CP1-16	South Pump House Exterior Soffit NE Corner	Off-White Cement Product	60% Chrysotile
Cement Panels	06-CP1-17	South Pump House Exterior Soffit SE Corner	Off-White Cement Product	60% Chrysotile
	06-CP1-18	South Pump House Exterior Soffit NW Corner	Off-White Cement Product	60% Chrysotile
ACCESSION OF CONCERNMENT OF CONCERNMENT	07-RF1-19	South Pump House Roof NE Corner Top Layer	Black Roof Material	None Detected
Tar Roofing	07-RF1-20	South Pump House Roof North Center Top Layer	Black Roof Material	None Detected
	Gypsum Board Ceiling Tank Insulation Window Glazing Exterior Caulking Exterior Joint Cloth Vibration Joint Cloth Cement Panels Tar Roofing	Number Number Sypsum Board Ceiling 01-WB2-03 Gypsum Board Ceiling 01-WB2-03 Tank Insulation 02-MI3-06 Tank Insulation 02-MI3-06 Window Glazing 03-SC1-08 Mute Woven 04-CA5-12 Wibration Joint Cloth 05-WP1-14 Vibration Joint Cloth 05-WP1-16 Vibration Joint Cloth 05-WP1-16 Tar Roofing 06-CP1-16 Tar Roofing 07-RF1-10 Tar Roofing 07-RF1-20	Number Number Control Control 01-WB2-01 South Pump House Interior Ceiling Keast Side 01-WB2-03 South Pump House Interior Ceiling Weast Side 01-WB2-03 South Pump House Interior Ceiling Weast Side 01-WB2-03 South Pump House Interior Ceiling Weast Side 01-WB2-05 South Pump House Interior Ceiling Weast Side 02-MI3-05 South Pump House Interior Ceiling Weast Side Vindow Glazing 02-MI3-05 South Pump House Interior SW Vessel 02-MI3-05 Vindow Glazing 02-SC1-07 South Pump House Interior SW Vessel 03-SC1-03 Vindow Glazing 03-SC1-03 South Pump House Interior North Center Vessel Vindow 03-SC1-03 South Pump House Exterior North Side 04-CA5-11 Vindow 03-SC1-03 South Pump House Exterior North Side 04-CA5-12 Vibration Joint Cloth 04-CA5-13 South Pump House Exterior North Side Vibration Joint Cloth 05-WP1-14 South Pump House Exterior North Side Vibration Joint Cloth 05-WP1-15 South Pump House Exterior Soff North Vibration Joint Cloth 05-WP1-16 South Pump House Exterior Soff North	Number Number<

		07-RF1-21	South Pump House Roof NW Corner Top Layer	Black Roof Material	None Detected
		08-RF1-22	South Pump House Roof NE Corner Bottom Layer	Black Roof Material	None Detected
80	Tar Roofing	08-RF1-23	South Pump House Roof North Center Bottom Layer	Black Roof Material	None Detected
		08-RF1-24	South Pump House Roof NW Corner Bottom Layer	Black Roof Material	None Detected
		09-RF4-25	South Pump House Roof NE Corner	Yellow/Black Flashing	PC 5.2% Chrysotile
60	Roof Flashing Tar	09-RF4-26	South Pump House Roof North Center	Yellow/Black Flashing	PC 5.4% Chrysotile
	52	09-RF4-27	South Pump House Roof NW Corner	Yellow/Black Flashing	PC 5.4% Chrysotile

-

APPENDIX C

ASBESTOS ANALYTICAL LABORATORY DATA



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

 Report Date:
 7/19/2022

 Report No.:
 664809 • PLM

 Project:
 Topeka Regional Airport Pump House North

 Project No.:
 02217386

Client; TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460741	Analyst Observation: Off-White Glazing	Location: North Pump House NE Corner
Client No.: 01-SC1-01	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460742	Analyst Observation: Off-White Glazing	Location: North Pump House SE Corner
Client No.: 01-SC1-02	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material.	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460742(L2)	Analyst Observation: Green Glazing	Location: North Pump House SE Corner
Client No.: 01-SC1-02	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460743	Analyst Observation: Off-White Glazing	Location: North Pump House SW Corner
Client No.: 01-SC1-03	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460744	Analyst Observation: White Caulk	Location: North Pump House Exterior NE
Client No.: 02-CA1-04	Client Description: Window Caulk	Corner
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460744(1.2) Client No.: 02-CA1-04	Analyst Observation: White Glazing Client Description: Window Caulk	Location: North Pump House Exterior NE Corner Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 2.6 Chrysotile	2 Tale	95.4

Please refer to the Appendix of this report for further information regarding your analysis.

7/13/2022

Date Received:

Date Analyzed:

Signature:

Analyst:

07/19/2022 Michael Moore

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Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219 Report Date:7/19/2022Report No.:664809 - PLMProject:Topeka Regional Airport Pump House NorthProject No.:02217386

Client: TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460745 Client No.: 02-CA1-05	Analyst Observation: White Caulk Client Description: Window Caulk	Location: North Pump House Exterior NW Corner
	The second s	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460746	Analyst Observation: White Glazing	Location: North Pump House Exterior SE
Client No.: 02-CA1-06	Client Description: Window Caulk	Corner
Percent Ashestos:	Percent Non-Ashestos Fibrous Material-	Percent Non-Fibrous Material:
PC 2.6 Chrysotile	3 Tale	94.4
Lab No.: 7460747	Analyst Observation: Brown/Silver Vibration Dampener	Location: North Pump House NF, Corner
Client No.: 03-WP1-07	Client Description: Canvas Vibration Joint Cloth	Air Handler
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	30 Cellulose	70
Lab No.: 7460748	Analyst Observation: Brown/Silver Vibration Dampener	Location: North Pump House NF. Corner
Client No.: 03-WP1-08	Client Description: Canvas Vibration Joint Cloth	Air Handler
Demand Ashartan	Persont New Asherton Fibraus Materials	Parant Nan Fibraus Matarial
New Datasta	30 Calluland	70
None Detected	30 Cellulose	
Lab No.: 7460749	Analyst Observation: Brown/Silver Vibration Dampener	Location: North Pump House NE Corner
Client No.: 03-WP1-09	Client Description: Canvas Vibration Joint Cloth	Air Handler
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	30 Cellulose	70
Lab No.: 7460750	Analyst Observation: White Vibration Dampener	Location: North Pump House Electric
Client No.: 04-WP1-10	Client Description: Woven Vibration Joint Cloth	Room
NAS FORMULA	- Construction of the second statement of a second statement of the second stat statement of the second statement of the se	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
90 Chrysotile	None Detected	10

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: Date Analyzed:

Signature:

Analyst:

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Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

 Report Date:
 7/19/2022

 Report No.:
 664809 • PLM

 Project:
 Topeka Regional Airport Pump House North

 Project No.:
 02217386

Client: TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460751	Analyst Observation: White Vibration Dampener	Location: North Pump House Electric
Client No.: 04-WP1-11	Client Description: Woven Vibration Joint Cloth	Room
Destances of Alexandra	B	Facility:
Percent Asbestos:	News Defended	Percent Non-Fibrous Material:
90 Chrysofile	None Delected	10
Lab No.: 7460752	Analyst Observation: White Vibration Dampener	Location: North Pump House Electric
Client No.: 04-WP1-12	Client Description: Woven Vibration Joint Cloth	Room
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
90 Chrysotile	None Detected	10
Lab No.: 7460753	Analyst Observation: Black Tar	Location: North Pump House Roof NE
Client No.: 05-RF1-13	Client Description: Tar Roofing	Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460754	Analyst Observation: Black Roof Material	Location: North Pump House Roof NW
Client No.: 05-RF1-14	Client Description: Tar Roofing	Corner
	A 6	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	5 Cellulose	95
Lab No.: 7460755	Analyst Observation: Black Tar	Location: North Pump House Roof SE
Client No.: 05-RF1-15	Client Description: Tar Roofing	Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material	Percent Non-Fibrous Material:
None Detected	2 Cellulose	98
Lab No.: 7460756	Analyst Observation: Black Flashing	Location: North Pump House Roof NE
Client No.: 06-RF4-16	Client Description: Tar Roof Flashing	Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	30 Cellulose	70

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: Date Analyzed:

Signature:

Analyst:

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Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

 Report Date:
 7/19/2022

 Report No.:
 664809 • PLM

 Project:
 Topeka Regional Airport Pump House North

 Project No.:
 02217386

Client; TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460757 Client No : 06-RF4-17	Analyst Observation: Black Flashing Client Description: Tar Roof Flashing	Location: North Pump House Roof NW Corner
chem than by REFER	cuent bescription: the two thanning	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 5.6 Chrysotile	3 Cellulose	91.4
Lab No.: 7460758	Analyst Observation: Black Flashing	Location: North Pump House Roof SE
Client No.: 06-RF4-18	Client Description: Tar Roof Flashing	Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 5.8 Chrvsotile	3 Cellulose	91.2

Please refer to the Appendix of this report for further information regarding your analysis,

Date Received: Date Analyzed:

Signature:

Analyst:

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07/19/2022	221152
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Approved By:

Frank Frankel

Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon 15620 W 113th Street Lenexa KS 66219

Client; TER436

Report Date:7/19/2022Report No.:664809 - PLMProject:Topeka Regional Airport Pump House NorthProject No.:02217386

Appendix to Analytical Report

Customer Contact:

Method: 40 CFR Appendix E to Subpart E of Part 763, interim method for the Determination of Ashestos in Bulk Insulation Samples, USEPA 600, R93-116 and NYSDOII ELAP 198.1 as needed.

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com iATL Office Manager:wchampion@iatl.com iATL Account Representative: Semih Kocahasan Sample Login Notes: See Batch Sheet Attached Sample Matrix: Bulk Building Materials Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www iATL com and in our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted, iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOII-FLAP No. 11021
- AIIIA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. PC Trace represents a <0.25% amount. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM_ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB) See additional information at the end of this appendix.



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

Client: TER436

Report Date:7/19/2022Report No.:664809 - PLMProject:Topeka Regional Airport Pump House NorthProject No.:02217386

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process) Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos în Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique - by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at customerservice/diatl.com.

- 1) Note: No mastic provided for analysis.
- 2) Note: Insufficient mastic provided for analysis.
- 3) Note: Insufficient material provided for analysis.
- 4) Note: Insufficient sample provided for QC reanalysis.
- 5) Note: Different material than indicated on Sample Log / Description.
- 6) Note: Sample not submitted.
- 7) Note: Attached to asbestos containing material.
- 8) Note: Received wet.
- 9) Note: Possible surface contamination.
- 10) Note: Not building material, 1% threshold may not apply.
- 11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
- 12) Note: Asbestos detected but not quantifiable.
- 13) Note: Multiple identical samples submitted, only one analyzed.
- 14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
- 15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.
- 16) Note: This sample contains >10% vermiculite mineral. See Appendix for Recommendations for Vermiculite Analysis.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites). Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. FPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

For New York State customers, NYSDOH requires disclaimers and qualifiers for various vermiculite containing samples that direct analysis via ELAP198.6 and ELAP198.8 for samples that contain >10% vermiculite mineral where ELAP198.6 may be used to evaluate the asbestos content of the material. However, any test result using ELAP198.6 will be reported with the following disclaimer: "ELAP198.6 method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing >10% vermiculite."

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.edc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional. NYS customers please follow current NYSDOH ELAP requirements per policy on subject of surfacing and vermiculite, May 6, 2016, Testing Requirements for Surfacing Material Containing Vermiculite (https://www.wadsworth.org/sites/default/files/WebDoc/1198_8_02_2.pdf)

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

 Analytical Step/Method: Initial Screening by PLM, FPA 600R-93/116 Requirements/Comments: Minimum of 0.1 g of sample, ~0.25% for most samples.



CERTIFICATE OF ANALYSIS

Теттасоп Client: 15620 W 113th Street KS Lenexa 66219

Client: TER436

Report Date: 7/19/2022 Report No .: 664809 - PLM Project: Topeka Regional Airport Pump House North Project No .: 02217386

2) Analytical Step/Method: Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)Analytical Step/Method: Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4) Analytical Step/Method: Wet Separation by TEM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)Analytical Step/Method: Wet Separation by TEM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only. *With advance notice and confirmation by the laboratory.

**Approximately 1 Liter of sample in double-bagged container (-9x6 inch bag of sample).

New York State Department of Health requires that samples originating from NYS that they categorize as Non-friable Organically Boand materials can only be confirmed as None Detected for asbestos by method 198.4. See the table below for a list of those materials. (ENVIRONMENTAL LABORATORY APPROVAL PROGRAM CERTIFICATION MANUAL - ITEM No. 198.1, Revision Date 5/6/16)

*Asphalt Shingles, Caulking, Ceiling Tiles with Cellulose, Duct Wrap, Glazing, Mastic, Paint Chips, Resilient Floor Tiles, Rubberized Asbestos Gaskets, Siding Shingles, Vinyl Asbestos Tile, NOB materials (other that SM-V) with <10% vermiculite, Any material (Friable or NOB other than SM-V) with <10% vermiculite.

Statistically derived uncertainty with any measure should be taken into consideration when reviewing and interpreting all reported data and results. A more comprehensive listing of accuracy, precision, and uncertainty as it impacts this method is available upon request.

C	IATL INTERNATIONAL ASTRONAL AND CONTRACTOR OF CUSTODY / Sample Log Bulk Asbestos			9000 Commerce Parkway Suite E Mt. Laurel, NJ 08054 Toll Free: 877 428-4285 <u>info@iatl.com</u> www.iatl.com	
	Client:	Terracon Consultants, Inc. (Terracon 15620 West 113th St. Lenexa, Kansas 66219) Project Name: Project No.:	Topeka Regiona Pum p Hous 022173 86	1 Aicport
	Office Phone Cell Phone:	e: <u>913-492-7777</u> 785-760-1658	Contact 1: Contact 2:	Timothy Easley	
	FAX / Emai Special Instructions	Please email results to tesasley@terracon.com	FAX / Email 2	913-492-7443	
land and the second sec	Matrix:	Air Soil Y Water Paint	Bulk E Surface Dust / Wipe	Other	
ſ	Analysis M	lethod:	TRANSFER STRANSFER		
	PLM : Bul	k Asbestos Building Materials EPA 600 / R nt Counting C : via ELAP 198.1 C : 400 Points C : 800 Points * C : other Points * vimetric Reduction LM : NOB via 198.6 LM : Friable via EPA 600 2.3 <1% by PLM, to TEM via 198.4 * <1% by PLM, Hold for Instructions ge and turnaround may be required. ** Alternat	PLM : Analyze Until P AUP : by Hon AUP : by Mat PLM : Non-Building M Soil or Verm PLM: Instructions for I Analyze and R Report Compo Report All Lay Only Analyze	ositive (Positive Stop) nogenous Area as Note erial Type as Noted Iaterial *, **(Dust, Wig iculite Analysis *, ** Multi-Layered Samples eport All Separable La site for Drywall Syster yers and Composite Wi and Report Specifically) may be recommended b	d be, Tape, Soil) s tyers per EPA 600 ns per NESHAP here Applicable y Noted Layer y Laboratory.
	Time: 10 Da * End of ne Sample Nu	y x 5 Day 3 Day 2 Da xt business day unless otherwise specified.	date / time y 1 Day* 12 Hou ••• Matrix Dependent. Please no ••• #4 Prop House	Verbals UFA	X La Email
	Please	Chent #(S): 07 - 27 - 300 (start) (end) use your sample log to supply sampling information (<pre>TATL#(S):</pre>	art) ns, etc.) or download forms	at iatl.com
Ċ	Relingu Receive Sample Sample Analysi QA/QC Archive	ished (Name / Organization): d (Name / iATL): Login (Name / iATL): Prep (Name / iATL): s(Name(s) / iATL): Review (Name / iATL): d / Released: QA/QC InterL.	AB Use: Da	ate: $7 - 12 \cdot 22$ ate:	Time: <u>5:00 p</u> Time: Time: Time: Time: Time: Time: Time: Time:

Asbestos Sample Location Log

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Project #- 02217386 Building - Topeka Regional Airport- North Pump House Inspector(s) - Tim Easley Signature - Azoof

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Color/Pattern/ Texture	Sample Location	Collection Date
window Glaze	North Pump House - NE corner	74607
t	- SE corner	74601
	- Sw corner	7460
Window Carlk	- exterior - NE corner	7460
1	- Nu corner	7460'
1	- JE wrat	7460
Canvas . Vibration	- NE corner air handler	7460
joint cloth		7460'
1		7480
Woven Vibration	- electric room	7460
joint clotz		74601
+ +		460
Tar	- Roof - NE corner	7460
I	Nw corner	746:)
1	SE corner	7460
Tan Root	- Roof - NE corner	746.01
Flashing	Nw corgen	74601
	SE cornor	P100
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		n - Stateman - S
	ColoriPatteri Texture Window Glaze Window Ca-1k Window Ca-1k Canvas Vibration Joint Cloth J Woven Vibration Joint Cloth J Tar Roofing Flashing	ColonPatient Sample Location Window North Pump House - NE corner 6 laze - SE corner 1 - SE corner <



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

 Report Date:
 7/19/2022

 Report No.:
 664810 - PLM

 Project:
 Topeka Regional Airport South Pump House

 Project No.:
 02217386

Client; TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460759 Client No.: 01-WB2-01	Analyst Observation: White Drywall Client Description: Gypsum Board Ceiling	Location: South Pump House Interior Ceiling East Side
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	3 Cellulose	97
Lab No.: 7460760	Analyst Observation: White Drywall	Location: South Pump House Interior
Client No.: 01-WB2-02	Client Description: Gypsum Board Ceiling	Ceiling Near Center Facility
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	3 Cellulose	97
Lab No.: 7460761	Analyst Observation: White Drywall	Location: South Pump House Interior
Client No.: 01-WB2-03	Client Description: Gypsum Board Ceiling	Ceiling West Side
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	3 Cellulose	97
Lab No.: 7460762	Analyst Observation: Brown/Black Insulation	Location: South Pump House Interior South
Client No.: 02-MI3-04	Client Description: Tank Insulation	Center Vessel
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
15 Chrysotile	None Detected	85
Lab No.: 7460763	Analyst Observation: Brown/Black Insulation	Location: South Pump House Interior North
Client No.: 02-MI3-05	Client Description: Tank Insulation	Center Vessel
Percent Asbestos:	Percent Non-Ashestos Fibrous Material	Percent Non-Fibrous Material
15 Chrysotile	None Detected	85
Lab No.: 7460764	Analyst Observation: Brown/Black Insulation	Location: South Pump House Interior SW
Client No.: 02-MI3-06	Client Description: Tank Insulation	Vessel Facility
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
15 Chrysotile	None Detected	85

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: Date Analyzed:

Signature:

Analyst:

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Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

 Report Date:
 7/19/2022

 Report No.:
 664810 - PLM

 Project:
 Topeka Regional Airport South Pump House

 Project No.:
 02217386

Client: TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460765	Analyst Observation: White Glazing	Location: South Pump House South Side
Client No.: 03-SC1-07	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460766	Analyst Observation: White Glazing	Location: South Pump House East Side
Client No.: 03-SC1-08	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460767	Analyst Observation: White Glazing	Location: South Pump House North Side
Client No.: 03-SC1-09	Client Description: Window Glaze	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	None Detected	100
Lab No.: 7460768 Client No.: 04-CA5-10	Analyst Observation: White Caulk Client Description: Exterior Caulk	Location: South Pump House Exterior North Side Window Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 2.8 Chrysotile	2 Cellulose	95.2
Lab No.: 7460769 Client No.: 04-CA5-11	Analyst Observation: White Caulk Client Description: Exterior Caulk	Location: South Pump House Exterior West Side Door Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 3.2 Chrysotile	None Detected	96.8
Lab No.: 7460770 Client No.: 04-CA5-12	Analyst Observation: White Caulk Client Description: Exterior Caulk	Location: South Pump House Exterior NW Corner Upper Wall Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 2.6 Chrysotile	None Detected	97,4

Please refer to the Appendix of this report for further information regarding your analysis.

7/13/2022

Date Received:

Date Analyzed:

Signature:

Analyst:

07/19/2022
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Michael Moore

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Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219

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 664810 - PLM

 Project:
 Topeka Regional Airport South Pump House

 Project No.:
 02217386

Client: TER436

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460771 Client No : 05-WP1-13	Analyst Observation: Off-White Vibration Dampener	Location: South Pump House Electric Room North Side
chene rom 05- wr (-15	Citer Description: World Visiation Joint Cion	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
90 Chrysotile	None Detected	10
Lab No.: 7460772	Analyst Observation: Off-White Vibration Dampener	Location: South Pump House Electric
Client No.: 05-WP1-14	Client Description: Woven Vibration Joint Cloth	Room North Side
Damant Achartan	Paraant Nan Ashartas Fibraus Matarial-	Facility: Paraant Man Fibraun Matarial:
90 Chrysotile	None Detected	10
Lab No.: 7460773	Analyst Observation: Off-White Vibration Dampener	Location: South Pump House Electric
Client No.: 05-WP1-15	Client Description: Woven Vibration Joint Cloth	Room North Side
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
90 Chrysotile	None Detected	10
Lab No.: 7460774	Analyst Observation: Off-White Cement Product	Location: South Pump House Exterior
Client No.: 06-CP1-16	Client Description: Cement Board	Soffit NE Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
60 Chrysotile	None Detected	40
Lab No.: 7460775	Analyst Observation: Off-White Cement Product	Location: South Pump House Exterior
Client No.: 06-CP1-17	Client Description: Cement Board	Soffit SE Corner
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material	Percent Non-Fibrous Material:
60 Chrysotile	None Detected	40
Lab No.: 7460776	Analyst Observation: Off-White Coment Product	Location: South Pump House Exterior
Client No.: 06-CP1-18	Client Description: Cement Board	Soffit NW Corner
and a statistication of the statistical statist	1209 922 W/11 W 1285 1286 1287	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
60 Chrysotile	None Detected	40

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: Date Analyzed:

Signature:

Analyst:

07/19/2022	
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Frank E. Ehrenfeld, III Laboratory Director



### CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219 

 Report Date:
 7/19/2022

 Report No.:
 664810 - PLM

 Project:
 Topeka Regional Airport South Pump House

 Project No.:
 02217386

Client: TER436

### PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460777 Client No.: 07-RF1-19	Analyst Observation: Black Roof Material Client Description: Roofing Tar	Location: South Pump House Roof NE Corner Top Layer
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	10 Cellulose	.90
Lab No.: 7460778	Analyst Observation: Black Roof Material	Location: South Pump House Roof North
Client No.: 07-RF1-20	Client Description: Roofing Tar	Center Top Layer Facility:
Percent Asbestos:	Percent Non-Ashestos Fibrous Material	Percent Non-Fibrous Material:
None Detected	10 Cellulose	90
Lab No.: 7460779	Analyst Observation: Black Roof Material	Location: South Pump House Roof NW
Client No.: 07-RF1-21	Client Description: Roofing Tar	Corner Top Layer
Percent Ashestos:	Percent Non-Asbestos Fibrous Material-	Percent Non-Fibrous Material
None Detected	10 Cellulosc	90
Lab No.: 7460780	Analyst Observation: Black Roof Material	Location: South Pump House Roof NE
Client No.: 08-RF1-22	Client Description: Roofing Tar	Corner Bottom Layer
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	10 Cellulose	90
Lab No.: 7460781	Analyst Observation: Black Roof Material	Location: South Pump House Roof North
Client No.: 08-RF1-23	Client Description: Roofing Tar	Center Bottom Layer
Percent Asbestos	Percent Non-Asbestos Fibrous Material	Percent Non-Fibrous Material:
None Detected	10 Cellulose	90
Lab No.: 7460782	Analyst Observation: Black Roof Material	Location: South Pump House Roof NW
Client No.: 08-RF1-24	Client Description: Roofing Tar	Corner Bottom Layer Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
None Detected	10 Cellulose	90

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: Date Analyzed:

Signature:

Analyst:

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Michael Moor	re

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Frank E. Ehrenfeld, III Laboratory Director



### CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219 

 Report Date:
 7/19/2022

 Report No.:
 664810 - PLM

 Project:
 Topeka Regional Airport South Pump House

 Project No.:
 02217386

Client; TER436

### PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7460783 Client No.: 09-RF4-25	Analyst Observation: Yellow/Black Flashing Client Description: Roof Flashing Tar	Location: South Pump House Roof NE Corner Facility:
Percent Asbestos: PC 5.2 Chrysotile	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 94.8
<b>I C 5.2</b> Chi ysolite		
Lab No.: 7460784	Analyst Observation: Yellow/Black Flashing	Location: South Pump House Roof North
Client No.: 09-RF4-26	Client Description: Roof Flashing Tar	Center
		Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 5.4 Chrysotile	None Detected	94.6
Lab No.: 7460785	Analyst Observation: Yellow/Black Flashing	Location: South Pump House Roof NW
Client No.: 09-RF4-27	Client Description: Roof Flashing Tar	Corner
	Provide a service of the context of the context of the context of the context of the service of the context	Facility:
Percent Asbestos:	Percent Non-Asbestos Fibrous Material:	Percent Non-Fibrous Material:
PC 5.4 Chrysotile	None Detected	94.6

Please refer to the Appendix of this report for further information regarding your analysis,

Date Received: Date Analyzed:

Signature:

Analyst:

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Approved By:

Frank Ena fol

Frank E. Ehrenfeld, III Laboratory Director



CERTIFICATE OF ANALYSIS

Client: Terracon 15620 W 113th Street Lenexa KS 66219

Client; TER436

Report Date:7/19/2022Report No.:664810 - PLMProject:Topeka Regional Airport South Pump HouseProject No.:02217386

### Appendix to Analytical Report

### Customer Contact:

Method: 40 CFR Appendix E to Subpart E of Part 763, interim method for the Determination of Ashestos in Bulk Insulation Samples, USEPA 600, R93-116 and NYSDOII ELAP 198.1 as needed.

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com iATL Office Manager:wchampion@iatl.com iATL Account Representative: Semih Kocahasan Sample Login Notes: See Batch Sheet Attached Sample Matrix: Bulk Building Materials Exceptions Noted: See Following Pages

### General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www iATL com and in our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted, iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

### Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

### Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOII-FLAP No. 11021
- AIIIA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. PC Trace represents a <0.25% amount. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM_ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB) See additional information at the end of this appendix.



### CERTIFICATE OF ANALYSIS

Client: Terracon

15620 W 113th Street Lenexa KS 66219 Report Date:7/19/2022Report No.:664810 - PLMProject:Topeka Regional Airport South Pump HouseProject No.:02217386

Client; TER436

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.; US EPA 600 R-4/004 (multi-tiered analytical process) Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V); ELAP 198.8 (PLM-SOF-V)

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.) ASTM D7521, CARB 435, and other options available

Asbestos în Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique - by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

### **Disclaimers / Qualifiers:**

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at customerservice/diatl.com.

- 1) Note: No mastic provided for analysis.
- 2) Note: Insufficient mastic provided for analysis.
- 3) Note: Insufficient material provided for analysis.
- 4) Note: Insufficient sample provided for QC reanalysis.
- 5) Note: Different material than indicated on Sample Log / Description.
- 6) Note: Sample not submitted.
- 7) Note: Attached to asbestos containing material.
- 8) Note: Received wet.
- 9) Note: Possible surface contamination.
- 10) Note: Not building material, 1% threshold may not apply.
- 11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
- 12) Note: Asbestos detected but not quantifiable.
- 13) Note: Multiple identical samples submitted, only one analyzed.
- 14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
- 15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.
- 16) Note: This sample contains >10% vermiculite mineral. See Appendix for Recommendations for Vermiculite Analysis.

### **Recommendations for Vermiculite Analysis:**

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites). Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. FPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

For New York State customers, NYSDOH requires disclaimers and qualifiers for various vermiculite containing samples that direct analysis via ELAP198.6 and ELAP198.8 for samples that contain >10% vermiculite mineral where ELAP198.6 may be used to evaluate the asbestos content of the material. However, any test result using ELAP198.6 will be reported with the following disclaimer: "ELAP198.6 method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing >10% vermiculite."

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.edc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional. NYS customers please follow current NYSDOH ELAP requirements per policy on subject of surfacing and vermiculite, May 6, 2016, Testing Requirements for Surfacing Material Containing Vermiculite (https://www.wadsworth.org/sites/default/files/WebDoc/1198_8_02_2.pdf)

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

 Analytical Step/Method: Initial Screening by PLM, EPA 600R-93/116 Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% for most samples.



### CERTIFICATE OF ANALYSIS

Client: Terracon 15620 W 113th Street Lenexa KS 66219

Client: TER436

Report Date:7/19/2022Report No.:664810 - PLMProject:Topeka Regional Airport South Pump HouseProject No.:02217386

2)Analytical Step/Method: Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)Analytical Step/Method: Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)Analytical Step/Method: Wet Separation by TEM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)Analytical Step/Method: Wet Separation by TEM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only. *With advance notice and confirmation by the laboratory. **Approximately 1 Liter of sample in double bound container (-9x6 inch has of sample).

**Approximately 1 Liter of sample in double-bagged container (-9x6 inch bag of sample).

New York State Department of Health requires that samples originating from NYS that they categorize as Non-friable Organically Bound materials can only be confirmed as None Detected for asbestos by method 198.4. See the table below for a list of those materials. (ENVIRONMENTAL LABORATORY APPROVAL PROGRAM CERTIFICATION MANUAL - ITEM No. 198.1, Revision Date 5/6/16)

*Asphalt Shingles, Caulking, Ceiling Tiles with Cellulose, Duct Wrap, Glazing, Mastic, Paint Chips, Resilient Floor Tiles, Rubberized Asbestos Gaskets, Siding Shingles, Vinyl Asbestos Tile, NOB materials (other that SM-V) with <10% vermiculite, Any material (Friable or NOB other than SM-V) with >10% vermiculite.

Statistically derived uncertainty with any measure should be taken into consideration when reviewing and interpreting all reported data and results. A more comprehensive listing of accuracy, precision, and uncertainty as it impacts this method is available upon request.

<b>IATL</b> INTERNATIONAL UTDATESTIC LOCATES	Custody / Samp lk Asbestos	ole Log S	9000 Commerce Parkwa Suite I Mt. Laurel, NJ 08054 Toll Free: 877 428-428 <u>info@iatl.com</u> www.iatl.com
Client: Terracon Consultants, Inc. (Terracon) 15620 West 113th St. Lenexa, Kansas 66219	Project Name Project No.:	: Topeka Regiona Pump Hous	l Aurport
Office Phone: <u>913-492-7777</u> Cell Phone: <u>785-760-1658</u>	Contact 1:	Timothy Easley	
FAX / Email 1: tim.easley@terracon.com         Special         Please email results to teessley@terracon.com         Instructions:	FAX / Email 2	913-492-7443	
Matrix: Air Soil X Bu Water Paint Sw	ilk rface Dust / Wipe	Other	
Analysis Method:			
PC: via ELAP 198.1     PC: 400 Points     PC: 800 Points *     PC: other Points *     PC: other Points *     PLM: Gravimetric Reduction     PLM: NOB via 198.6     PLM: Friable via EPA 600 2.3     If <1% by PLM, to TEM via 198.4 *     If <1% by PLM, Hold for Instructions     * Additional charge and tumaround may be required. ** Alternative M	PLM : Analyze Until AUP : by Ho AUP : by Ma PLM : Non-Building I Soil or Vern PLM: Instructions for Report Comp Report All La Only Analyze	Positive (Positive Stop) mogenous Area as Noted terial Type as Noted Material *, **(Dust, Wip niculite Analysis *, ** Multi-Layered Samples Report All Separable La osite for Drywall Systen yers and Composite Wh and Report Specifically 4) may be recommended by	d pe, Tape, Soil) yers per EPA 600 ns per NESHAP iere Applicable y Noted Layer y Laboratory.
Turnaround Preliminary Results Requested By Time:	date / time	Verbals G FA	X 🔄 Email
<ul> <li>10 Day  5 Day  3 Day  2 Day</li> <li>* End of next business day unless otherwise specified.</li> </ul>	1 Day* 12 Ho Matrix Dependent. Please n	ur** 6 Hour** otify the lab before shippin	E RUSH**
Sample Numbers: 01 - 18 - North Client #(s): 01 - 27 - 500 72 H (start) (end) H Please use your sample log to supply sampling information (ex. Ve	Prop House Frop iATL#(s): foures, areas, descriptions, locations	art)	Totals
Chain of Custody: Relinquished (Name / Organization): Received (Name / iATL): Sample Login (Name / iATL): Sample Prep (Name / iATL): Analysis(Name(s) / iATL): QA/QC Review (Name / iATL): Archived / Released: OA/OC InterLABT	- D D D D D D D D D D D D D D D D D D D	ate: 7-12-22 ate: ate: ate: ate: ate:	Time: 5:00 ps Time: 1

### Asbestos Sample Location Log

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02217386 Project # -Building - Topeka Regional Airport - South Pump House Inspector(s) - Tim Easley Signature Signature -"it Eng

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THA	Sample Numb -BS Code-Sam	er ole No)	Color/Pattern/	Sample Location	Collection Date
01	- WRO		67psum Barrow	South Pump - interior cuiling - castside	74607
	002	0(	Ceiling	House - near center	74607
-+	· · ·	02	1	a the la	
Ą	• + •	03	4	- W=ST41KA	14407
07	- MI3	64	Tank I I I	Interior - South conter versel	74607
	4 <u> </u>		I ALL TATION	porth center vessel	7460?
-+	-   .	05		sw versal	74607
		06	window	south side	74669
03	- 201-	07	Glazz	auch side	19591
		08			74602
ł	- ] -	09	l ł ŀ	north side	7460?
04	· CAS ·	10	Exterior Carlk	exterior - north side window	74607
			1	- west side door	7450?
1	- / -			- NW corner upperwall	7460?
90	- WPI -		woven	- electric room- north side	74922
	- 1 -	<u> </u>	Joint		H 1000
1					
56		15	l coment	Exterior Soffit. NEconar	74477
06	- CPI -	16	Board	1 SE carmer	74697
1	· 1-	17			7407
1	- 1 -	18		1 NW Corner	74607
07	· kr.	10	Rosting	Roof - A Ecornan - top layer	7460?
			Jar	" North canter	74603
-1		20		- New 10000	12.1807

### Asbestos Sample Location Log

Page_ of

Project # -02217386 Topeka Regional Airport - South Pump House Tim Easley Sufferf Juilding -Inspector(s) -Signature -

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	Sample Number (HA-BS Code-Sample No)	Color/Pattern/ Texture	Sample Location	Collection Date
	08 PF1 22	Rooting Tar	South Pump - Roof - NE corner - Botton House 1 Layer	74,6278
	1 - 1 - 23	I	- north center	7460781
	f - f - 24		- NW Lorner	7460782
	09 - RFY- 25	Roof . +Justing	Roof - NE corner	7460783
100	1	tar	- north center	7460764
	27		- NW corner	7460735
	1941 (B			
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APPENDIX D

### XRF PAINT TEST RESULTS

XRF Paint Test Results Date: July 11, 2022

### Topeka Regional Airport Pump Houses

Terracon Project No. 02217386

	characteritaria	ni.	1 Biop	endes		Parketurate	Calas	e da la composición de la composición d
Reading	DACC	PD	Location	Side	Component	Substrate	Color	Condition
2	Positive	117	Instrument Calibration NIST 2573					
2	Positive	1.17	Instrument Calibration NIST 2573					
4	Positive	1.13	Instrument Calibration NIST 2573					
5	Negative	0.17	North Pump House	Fast	Wall	Concrete Block	White	Peeling
6	Negative	0.18	North Pump House	Fast	Wall	Concrete Block	Grev	Peeling
7	Negative	0.05	North Pump House	South	Wall	Concrete Block	White	Peeling
8	Negative	0.14	North Pump House	South	Wall	Concrete Block	Grev	Peeling
9	Negative	0.85	North Pump House	South	Window Frame	Metal	White	Fair
10	Negative	0.65	North Pump House	South	Window Frame	Metal	White	Intact
11	Negative	0.55	North Pump House	West	Door	Metal	Grev	Fair
12	Negative	0.58	North Pump House	West	Door Jamb	Metal	Grev	Intact
13	Negative	0.11	North Pump House	West	Wall	Concrete Block	White	Peeling
14	Negative	0.12	North Pump House	West	Wall	Concrete Block	Grev	Peeling
15	Negative	0.13	North Pump House	North	Wall	Concrete Block	White	Peeling
16	Negative	0.09	North Pump House	North	Wall	Concrete Block	Grev	Poor
17	Negative	0.27	North Pump House	North	Window Frame	Metal	White	Fair
18	Negative	0.19	North Pump House	North	Ceiling	Concrete	White	Intact
19	Negative	0.07	North Pump House	North	Radiator Cabinet	Metal	Brown	Intact
20	Negative	0.85	North Pump House	North	Air Duct	Metal	White	Fair
21	Negative	0.03	North Pump House		Ceiling	Concrete	White	Intact
22	Negative	0.04	North Pump House		Ceiling	Concrete	White	Intact
23	Negative	0.13	North Pump House	West	Column	Concrete	White	Intact
24	Negative	0.44	North Pump House	West	Air Duct	Metal	White	Intact
25	Negative	0.15	North Pump House	East	Column	Concrete	White	Intact
26	Positive	1.01	North Pump House	East	Air Duct	Metal	White	Intact
27	Negative	0.41	North Pump House	West	Vessel	Metal	Silver	Fair
28	Negative	0.19	North Pump House	West	Pump 5	Metal	Silver	Fair
29	Positive	5	North Pump House	West	Fuel Pine	Steel	Silver	Fair
30	Negative	0.24	North Pump House	11.5.01	Vessel	Metal	Silver	Fair
31	Negative	0.23	North Pump House		Pump 6	Metal	Silver	Intact
32	Positive	3.75	North Pump House		Fuel Pipe	Metal	Silver	Intact
33	Negative	0.28	North Pump House	East	Vessel	Metal	Silver	Poor
34	Negative	0.25	North Pump House	East	Pump 8	Metal	Silver	Intact
35	Positive	4.5	North Pump House		Fuel Pipe	Steel	Silver	Poor
36	Negative	0.77	North Pump House	East	Door	Metal	Grev	Intact
37	Negative	0.06	North Pump House electric room	South	Wall	Concrete Block	Grev	Peeling
38	Positive	1	North Pump House electric room	South	Wall	Concrete Block	Grev	Poor
39	Negative	0.09	North Pump House electric room	East	Wall	Concrete Block	Grev	Peeling
40	Negative	0.09	North Pump House electric room	North	Wall	Concrete Block	Grev	Peeling
41	Positive	5	North Pump House electric room	North	Window Frame	Metal	Grev	Peeling
42	Negative	0.01	North Pump House electric room	1.4.5.4711	Ceiling	Concrete	Tan	Peeling
43	Positive	1	North Pump House electric room		Ceiling	Concrete	Tan	Peeling
44	Positive	1	North Pump House electric room		Floor	Concrete	Grev	Intact
45	Negative	0.18	North Pump House electric room	Fast	Pump selector panel	Metal	Grev	Peeling
46	Negative	0.14	North Pump House electric room	East	Conduit	Metal	Silver	Peeling
47	Negative	0	North Pump House exterior	North	Wall	Concrete Block	White	Intact
48	Positive	5	North Pump House electric room	North	Door	Metal	Grev	Intact
49	Positive	5	North Pump House electric room	North	Door Jamb	Metal	White	Peeling
50	Positive	2.04	North Pump House exterior	North	Wall	Concrete	Green	Intact
51	Negative	0.81	North Pump House exterior	North	Gutter	Metal	Green	Intact
52	Positive	5	North Pump House exterior	North	Window	Metal	White	Poor
53	Positive	1.48	North Pump House exterior	North	Fuel Pipe	Metal	White	Solid
		and the second second					1 THERE WAS	and the second second

Lead containing paint as determined

by paint chip analysis in green

### XRF Paint Test Results Date: July 11, 2022

### Topeka Regional Airport Pump Houses

Terracon Project	No.	02217386
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55	Positive	1	North Pump House exterior	North	Tank Cover	Metal	Green	Peeling
56	Positive	5	North Pump House exterior	North Pump House exterior North Fuel Vent Pine		Metal	White	Fair
57	Negative	0.08	North Pump House exterior	North Pump House exterior North Tank Cover		Metal	Yellow	Fair
58	Negative	0.04	North Pump House exterior	East	Wall	Concrete Block	White	Peeling
59	Negative	0.96	North Pump House exterior	Fast	Wall	Concrete Block	Green	Intact
60	Negative	0.33	North Pump House exterior	East	Gutter	Metal	Green	Intact
61	Negative	0.02	North Pump House exterior	East	Fuel Pipe	Metal	Yellow	Intact
62	Negative	0.01	North Pump House exterior	East	Bollard post	Metal	Yellow	Intact
63	Positive	1:95	North Pump House exterior	East	Door	Metal	Grev	Intact
64	Negative	0.01	North Pump House exterior	South	Wall	Concrete Block	White	Peeline
65	Positive	2.18	North Pump House exterior	South	Wall	Concrete	Green	Intact
66	Negative	0.37	North Pump House exterior	West	Gutter	Metal	Green	Intact
67	Negative	0.03	North Pump House exterior	South	Downspout	Metal	White	Intact
68	Positive	1	North Pump House exterior	South	Tank Cover	Metal	Green	Peeling
69	Positive	1	North Pump House exterior	South	Tank Cover	Metal	Yellow	Intact
70	Negative	0.09	South Pump House	East	Wall	Concrete Block	White	Peeling
71	Negative	0.08	South Pump House	East	Wall	Concrete Block	Grev	Peeling
77	Negative	0.09	South Pump House	East	Window Frame	Metal	White	Peeling
73	Positive	1	South Pump House	South	Wall	Concrete Block	White	Poor
74	Positive	11	South Pump House	South	Wall	Concrete Block	Grev	Peeling
75	Negative	0.09	South Pump House	West	Wall	Concrete Block	White	Peeling
76	Positive	51.5	South Pump House	West	Wall	Concrete Block	Grev	Peeling
77	Negative	0.14	South Pump House	South	Door	Drywall	Tan	Peeling
78	Negative	0.06	South Pump House	South	Door Jamb	Metal	Tan	Peeling
79	Positive	1	South Pump House	North	Wall	Concrete Block	White	Peeling
80	Positive	1	South Pump House	North	Wall	Concrete Block	Grev	Peeling
81	Negative	0.03	South Pump House	North	Radiator Cabinet	Metal	Brown	Rusted
82	Negative	0.07	South Pump House	North	Window Frame	Metal	White	Peeling
83	Negative	0.09	South Pump House	North	Air Duct	Metal	White	Intact
84	Positive	1	South Pump House		Ceiling	Drywall	Тап	Poor
85	Negative	0.05	South Pump House	East	Bar Joist	Steel	Tan	Peeling
86	Positive	1	South Pump House		Ceiling	Drywall	Tan	Peeling
87	Negative	0.06	South Pump House		Bar Joist	Steel	Tan	Poor
88	Positive	1	South Pump House	West	Ceiling	Drywall	Tan	Poor
89	Negative	0.01	South Pump House		Bar Joist	Steel	Tan	Peeling
90	Negative	0.12	South Pump House	East	Vessel	Metal	Black	Peeling
91	Negative	0.11	South Pump House	East	Vessel	Metal	White	Peeling
92	Negative	0.3	South Pump House	West	Vessel	Metal	Black	Peeling
93	Negative	0.05	South Pump House	South	Pump	Metal	Tan	Peeling
94	Positive	5	South Pump House		Fuel Pipe	Steel	Tan	Peeling
95	Positive	1.38	South Pump House	East	Fuel Pipe	Steel	Tan	Peeling
96	Positive	5	South Pump House	West	Fuel Pipe	Steel	Tan	Peeling
97	Positive	2.51	South Pump House electric room	North	Wall	Concrete Block	Grey	Peeling
98	Negative	0.06	South Pump House electric room	West	Wall	Concrete Block	Grey	Peeling
99	Positive	2.73	South Pump House electric room	East	Wall	Concrete Block	Grey	Peeling
100	Negative	0.18	South Pump House electric room	East	Pump Control panel	Metal	Tan	Peeling
101	Negative	0.32	South Pump House electric room	East	Conduit	Metal	Grey	Peeling
102	Negative	0.19	South Pump House electric room	West	Door	Metal	White	Peeling
103	Positive	2.76	South Pump House electric room	West	Door Jamb	Metal	Grey	Intact
104	Negative	0.23	South Pump House electric room	West	Electric panel	Metal	Grey	Peeling
105	Positive	2.1	South Pump House electric room		Ceiling	Drywall	Tan	Poor
106	Negative	0.18	South Pump House electric room		Air Duct	Metal	Tan	Intact
107	Positive	4.3	South Pump House exterior	West	Door	Metal	Tan	Poor
108	Negative	0	South Pump House exterior	East	Wall	Concrete Block	Tan	Peeling
109	Negative	0	South Pump House exterior	West	Upper Wall	Concrete	Yellow	Peeling
			Positive Lead	results i	n red			

Lead containing paint as determined

Pb = Lead in milligrams per square centimeter by t

by paint chip analysis in green

Inspector - Timothy Easley Kansas License No. KS10-3090 **XRF** Paint Test Results Date: July 11, 2022

### Topeka Regional Airport Pump Houses

110	Positive	4,72	South Pump House exterior
111	Negative	0	South Pump House exterior
112	Negative	O	South Pump House exterior
113	Positive	2.84	South Pump House exterior
114	Positive	3.61	South Pump House exterior
115	Negative	0.33	South Pump House exterior
116	Negative	0.06	South Pump House exterior
117	Negative	0.03	South Pump House exterior
118	Positive	2.5	South Pump House exterior
119	Negative	0.01	South Pump House exterior
120	Negative	0.05	South Pump House exterior
121	Positive	3.87	South Pump House exterior
122	Positive	3.37	South Pump House exterior
123	Negative	0.43	South Pump House exterior
124	Negative	0.05	South Pump House exterior
125	Negative	ο	South Pump House exterior
126	Positive	1.18	South Pump House exterior
127	Positive	1.18	Instrument Calibration NIST 2573
128	Positive	1.12	Instrument Calibration NIST 2573
129	Positive	1.11	Instrument Calibration NIST 2573

ouses		
West	Soffit	Cement Par
North	Wall	Concrete Bl
North	Upper Wall	Concrete
North	Soffit	Cement Par
North	Window Frame	Metal
North	Fuel Pipe	Steel
North	Fuel Pipe	Steel
North	Tank Cover	Steel
East	Fuel Pipe	Steel
East	Wall	Concrete Bl
East	Upper Wall	Concrete
East	Soffit	Cement Par
South	Window Frame	Metal
South	Fuel Pipe	Steel
South	Fuel Pipe	Metal
South	Tank Cover	Metal
South	Fuel Pipe	Steel

### Terracon Project No. 02217386

(1.)	34-10 Arrs 2-10	
Cement Panel	Yellow	Peeling
Concrete Block	Tan	Peeling
Concrete	Yellow	Peeling
Cement Panel	Yellow	Peeling
Metal	Tan	Poor
Steel	Tan	Peeling
Steel	White	Peeling
Steel	White	Poor
Steel	White	Peeling
Concrete Block	Tan	Peeling
Concrete	Tan	Peeling
Cement Panel	Yellow	Peeling
Metal	Tan	Peeling
Steel	White	Peeling
Metal	White	Poor
Metal	White	Peeling
Steel	Tan	Peeling

Positive Lead results in red

Lead containing paint as determined by paint chip analysis in green

Inspector - Timothy Easley Kansas License No. KS10-3090

### APPENDIX E

### LEAD ANALYTICAL LABORATORY DATA



2033 HERITAGE PARK DR, OKLAHOMA CITY, OK 73120 1.800.822.1650

### Environmental Chemistry Analysis Report

QuanTEM Set ID:	348493	Client:	Terracon - Lenexa
Date Received:	07/13/22		15620 W 113th St
Received By:	Baylie Longstreth		Lenexa, KS 66219
Date Sampled:			
Time Sampled:		Acct. No.:	B403
Analyst:	CR		
Date of Report:	07/19/22	Project:	Topeka Regional Airport
2		Location:	6510 SE Forbes Ave Topeka KS
AIHA LAP, LLC: 101352		Project No.:	02217386
Date of Report: AIHA LAP, LLC: 10	07/19/22 0352	Project: Location: Project No.:	Topeka Regional Airport 6510 SE Forbes Ave Topeka KS 02217386

QuanTEM ID	Client ID	Matrix	Parameter	Results	Reporting Limits	Units	Date/Time Analyzed	Method
001	P-01	Paint	Lead	0.082	0.005	%	07/19/22 13:59	P EPA 7000B (1)
002	P-02	Paint	Lead	0.34	0.005	90	07/19/22 13:59	P EPA 7000B (1)
003	P-03	Paint	Lead	3.1	0.005	%	07/19/22 13:59	P EPA 7000B (1)
004	P-04	Paint	Lead	0.15	0.005	96	07/19/22 13:59	P EPA 7000B (1)
005	P-05	Paint	Lead	0.27	0.005	%	07/19/22 13:59	P EPA 7000B (1)
006	P-06	Paint	Lead	0.28	0.005	%	07/19/22 13:59	P EPA 7000B (1)

Authorized Signature:

Charry Bussen)

Cherry Rossen. Technical Manager

Note: Sample results have not been corrected for blank values.

This report applies only to the standards or procedures indicated and to the specific samples tested. It is not indicative of the qualities of apparently identical or similar products or procedures, nor does it represent an ongoing assurance program unless so noted. These reports are for the exclusive use of the client and are not to be reproduced without specific written permission. QuanTEM is not responsible for user-supplied data used in calculations. Customer provided data such as volumes, areas, etc., cannot be verified by QuanTEM Laboratories, LLC.

Unless otherwise noted, upon receipt the condition of the sample was acceptable for analysis.

Wipe materials must meet ASTM E1792 criteria. Method detection limits and resultant reporting limits may not be valid for non-ASTM E1792 wipe material.

EPA Method 7000B (1) = EPA 600/R-93/200 Preparation Modified. EPA 7000B Analysis Modified

EPA Method 7082 (2) = EPA 600/R-93/200 Preparation Modified. EPA 7082 Analysis Modified

<b>Supplemental Report</b>
QAQC Results

Date:	7/19/2022	Lab Number:	348493
Matrix:	Paint	Approved By:	Cherry Rossen
		Date Approved:	7/19/2022

Notes:

QA ID:

Test:

### Blank Data:

Type of Blank	Blank Value
FCB	0
ICB	0
Matrix Blank	0

20165

Lead

### Standards Data:

Standard	Low Limit	Obtained	High Limit
ccv	2.2	2.5	2.8
FCV	2.2	2.4	2.8
RLVS	0.05	0.11	0.15
ICV	0.9	1	1.1

### **Duplicate Data:**

Sample Number	Result	Duplicate	% RPD
348493-001	1.644	1.573	4,4

### **Recovery Data:**

Sample Number	Result	Spike Level	Result + Spike	% Recovery	Dup. Result + Spike	% Dup. Recovery	% Spike RPD
LCS-P1	0.000	2.226	2.400	107.8	2.368	106.4	1.4
348493-001	1.644	2.000	3.498	92.7	5		

Charg Prisser)

Authorized Signature:

Cherry Rossen, Technical Manager

Page 1 of 1

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### APPENDIX F

### CERTIFICATIONS/LICENSES

CTOR REFRESHER	ERTIFICATE	to certify that E. Easley	asbestos accreditation under TSCA Title II and ed examination with a score of at least 70%.	Department of Natural Resources	Course Instructor	Terracon Consultants, Inc. 1815 South Eisenhower Street Wichita, Kansas 67209 (316) 262-0171
ASBESTOS INSPE	COURSE CI	This is Tim H	has completed the requisite training for a 40 CFR 763 and passed the associate	Accredited by the Missouri I	Certificate Number: 102221TERWICIR005	Course Location:ONLINECourse Date:October 22, 2021Examination Date:October 22, 2021Expiration Date:October 22, 2022
AN Kansas Department of Health and Environment Lee A. Norman, M.D., Secretary Lee a. Norm Be it known, that having properly filed application with the Kansas Department of Health and Environment, Kansas Department of Health and Environment October 1, 2022 Expiration Date. Certification Number : KS310-3090 is hereby certified as a **Timothy Easley** Lead Inspector 新聞的にていて STATISTICS. July 16,2020 Issue Date:

FOE Fuel Farm Topeka Regional Airport AIP 3-20-0113-045

### APPENDIX C

### **CONSTRUCTION SAFETY & PHASING PLAN**

## **CONSTRUCTION SAFETY & PHASING PLAN**

## FOE FUEL FARM AIP PROJECT NO. 3-20-0113-045



TOPEKA REGIONAL | BILLARD AIRPORT & BUSINESS CENTER

TOPEKA REGIONAL AIRPORT TOPEKA, KANSAS

13 JAN 2023



300 Wyandotte, Suite 200 Kansas City, Missouri 64105 TEL: 816-702-4300

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### APPENDICES:

- 1 Safety and Phasing Plan Checklist 150/5370-2G, Appendix C
- 2 Construction Project Daily Safety Inspection Checklist 150/5370-2G, Appendix D
- 3 Construction Safety and Phasing Plans

#### INTRODUCTION

The project consists of the construction of a new fuel farm north of building 627 at Topeka Regional Airport in Topeka, Kansas. It also includes the removal of the existing fuel farm located across Taxiway Alpha from the Air Traffic Control Tower. The existing fuel farm is outdated and requires crossing an active taxiway for unloading over the road fuel trucks as well as loading the FBO refueling trucks.

The duration of the project shall be completed in 300 consecutive calendar days.

The project will be completed in two phases. The first phase will be to construct and commission the new fuel farm system. Once the new fuel farm is up and operational, the existing fuel facility will be demolished and disposed of offsite.

This Narrative was prepared to meet the requirements of FAA Advisory Circular 150/5370-2 current edition, "*Operational Safety on Airports During Construction*. The project area is shown in the attached Construction Safety and Phasing Plans in Appendix 3.

The prime responsibility for safety, supervision, and inspection of airfield construction projects lies with the airport owner/operator. Aviation safety is the primary consideration at airports especially during construction. The primary goal is to provide the highest possible level of safety, security and efficiency to all the airport users; from the airlines and tenants to the construction contractors and ultimately the traveling public.

To ensure this highest level of safety is maintained a Construction Safety Phasing Plan has been developed specifically for the FOE Fuel Farm. The purpose of the CSPP is to identify all construction activities that will occur within the Aircraft Operations Area (AOA) of the airfield and define how each construction area will comply with the requirements of FAR Part 139 and all applicable FAA rules and regulations.

The CSPP is a standalone document written to correspond with the safety and security set forth in Advisory Circular 150/5370-2 current edition, and the Metropolitan Topeka Airport Authority's safety and security requirements and all local codes, requirements and procedures. The CSPP is to be used by all personnel involved in the project. The CSPP covers the actions and responsibilities of design, construction, inspection and airport personnel.

Prior to the start of the project the contractor will submit a "Safety Plan Compliance Document" (SPCD). Within the content of the SPCD the contractor will include a statement that they have read and understand the CSPP and how they will comply with all the requirements and safety procedures detailed within it. Any information not discussed in the original CSPP or ANY changes to the constructability of the project MUST be outlined in the SPCD and submitted to the airport for review. The SPCD must be submitted to and approved by the airport prior to the start of any work.

In the event the contractor's activities are found to be in non-compliance with the requirements of the CSPP or SPCD, the airport's representatives will direct the contractor in writing to immediately stop all operations of that particular work until such time all deficiencies are mitigated and/or corrected to the satisfaction of the airport.

The CSPP and SPCD will be available at all times on the jobsite. It is the responsibility of the contractor to ensure all construction personnel are familiar with the safety procedures and regulations of the airport.

#### 1. COORDINATION

#### Pre-construction conference

A pre-construction conference will be held prior to the start of work on the project at least two weeks prior to the start of work. During the pre-construction conference, the Contractor's safety plan compliance document (SPCD) and his adherence to his safety plan will be discussed. Reviews of adherence to the safety plan will take place during construction progress meetings.

#### Project progress meetings

Project progress meetings will be held during the course of construction. Those required to attend the meeting will include the MTAA, the owner's representative, the air traffic control tower chief, the Contractor (minimum of the project superintendent) and subcontractors who will be providing work during the period of time between the current meeting and the next project progress meeting. FAA facilities personnel, safety personnel, and fixed base operators (FBO) will have a standing invitation to these meetings and will attend as required, or if they feel they have a need to be present. The meeting will generally be held on a bi-weekly basis, depending on the critical items of work and mutual agreement between the MTAA, the Owner's Representative, and the Contractor. Meeting dates and times will be established at the pre-construction conference. Meeting locations will be at the MTAA administration office located at 6510 SE Forbes Ave, Topeka, KS 66619.

#### FAA ATO coordination

Coordination with FAA ATO will be made via submission of this CSPP and NOTAMs issued during the construction project.

### 2. PHASING

#### Phase Elements

Work shall be accomplished in two phases. Construction shall be substantially complete and accepted within three hundred (300) consecutive calendar days from Notice-To-Proceed (NTP). The Contractor shall develop a construction safety plan that complies with current FAA Advisory Circular 150/5370-2 current edition *"Operational Safety on Airports During Construction"*, or the latest version. The safety plan shall address all safety considerations in accordance with the Advisory Circular and must be submitted to the Project Design Engineer for approval before work can begin.

Project Design Engineer will approve contractor's proposed schedule prior to issuance of NTP. Contractor to notify Project Design Engineer in writing if a change to schedule is proposed prior to schedule element completion date

# vsp

The Contractor's schedule shall allow for, at minimum, 30-minutes to perform field inspections prior to opening airfield pavement to traffic.

#### Construction Safety Drawings

See Appendix 3 plans for phase area limits, haul route details and contractor staging area.

### 3. AREAS AND OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY

#### Identification of Affected Areas

See Appendix 3 plans for the phasing of construction and safety areas for the project to avoid any safety problems with incursions of construction vehicles/pedestrians and aircraft operations and any other safety issue relating airport operations. The project is within the movement area of the Aircraft Operations Area (AOA). Coordination with the Air Traffic Control Tower (ATCT) is necessary when operating inside the RSA, and with ground control when operating anywhere else inside the AOA. Contractor shall be responsible for obtaining clearance to cross active taxiways.

Airport operations take precedence over all work, especially if a question of safety is involved. Special conditions such as low visibility, snow removal, aircraft in distress, aircraft accident, security breach, or work being completed by others may require the rescheduling work to accomplish air safety. Full compensation for all costs involved in rescheduling and moving from one work area to another, including work stoppage caused by airport operations will be considered as included in the contract prices paid for contract items of work involved and not additional compensation.

#### Mitigation of Effects

Emergency operating conditions may require the Contractor's personnel and/or equipment be temporarily cleared from the safety areas. The contract documents will mandate that the Contractor immediately comply with directives from the Airport Operations and Air Traffic Control personnel during these emergency conditions.

The Contractor's vehicles for personnel, materials and/or equipment delivery shall use load covers and shall be checked to confirm load and equipment are secure to the vehicle. Any material, parts of equipment, tools, trash or other debris that fall from the vehicle onto the aircraft operations area (AOA) are considered potential foreign object debris (FOD). Any FOD dropped from the contractor vehicles on the AOA shall be retrieved and cleaned up immediately as FOD is serious danger to aircraft and cause severe damage to aircraft.

<u>Precautions for control of vehicular traffic on AOA</u>: Contractor's vehicles will not be allowed access to portions of the airport other than the work and staging areas. All of the Contractor's motorized vehicles operating in the AOA shall be equipped with a rotating yellow beacon or a 3-foot square checkered orange and white flag as specified in current FAA Advisory Circular 150/5210-5D "Painting, Marking, and Lighting of Vehicles Used on an Airport".

<u>Means of separating construction area from active AOA</u>: Contractor shall provide temporary fence per the plans which will temporarily move the AOA during phase 1. Phase 2, the contractor shall provide at their costs and use portable low-level, lighted barricades to establish limits of construction equipment when parked at the work areas. Barricades must be highly visible and weighted with sandbags to prevent from being blown over by jet blast. Silt fence with wood stakes would be an approved alternative. Contractor should reference FAA Advisory Circular 150/5370-2 current edition, *Operational Safety on Airports During Construction* with reference to barricades; specifically, Pages 2-30 through 2-32, Section 2.20.2 Equipment.

<u>Radio Communication</u>: The Contractor shall obtain and is required to have at all times a sufficient number of operable radios, tuned to the Topeka Regional Airport ground control frequency, 121.90HZ. All Contractor vehicles in the AOA must be in radio contact with the Air Traffic Control Tower at all times or be under escort by a vehicle with radio contact at all times. The cost of providing radios and escorts shall be included in the cost of the project.

The Contractor shall, before the start of construction, test his/her radio with the appropriate agencies to demonstrate the capabilities and to demonstrate the performance of the operator and the equipment.

<u>Flaggers</u>: The contractor will be required to provide a flagger when construction traffic and/or haul traffic will cross an active taxiway, to be coordinated with ATCT.

<u>Barricades and their maintenance:</u> Contractor shall provide at their costs and use portable low-level, lighted barricades to establish limits of construction equipment when parked at the work areas. Barricades must be highly visible and weighted with sandbags to prevent from being blown over by jet blast. Silt fence with wood stakes would be an approved alternative. Contractor should reference FAA Advisory Circular 150/5370-2 current edition, *Operational Safety on Airports During Construction* with reference to barricades; specifically, Pages 2-30 through 2-32, Section 2.20.2 Equipment.

<u>ARFF/Emergency Airport Operation Routes:</u> Open taxi routes will be available to ARFF and Emergency personnel to access any portion of the open, operating AOA pavements. Contractor shall give right of way to all aircraft, ARFF and Airport vehicles. Contractor vehicles shall stay on the designated vehicle service road or access roads at all times.

<u>Safety flag on equipment:</u> All construction equipment that is not outfitted with a rotating yellow beacon light atop of the vehicle will display a 3-foot square orange and white checkered construction safety flag in a predominant location at the top of the vehicle.

<u>Equipment height restrictions</u>: No large structures are being erected. Construction equipment shall be 15-foot or less in height.

- 4. PROTECTION OF NAVIGATION AIDS (NAVAID'S)
  - A. No navigation aids are impacted by the construction of this project.



### 5. CONTRACTOR ACCESS

#### Location of Stockpiled Construction Materials

Stockpiles shall not penetrate the FAR Part 77 imaginary surfaces or present FOD problems. Stockpiles shall not exceed 15-foot in height. The Contractor is responsible for the security of their materials. The stockpile and staging locations are shown on the Construction Safety & Phasing Plan, see Appendix 3. Any approved storage of equipment will not present a line of sight problem with FAA Air Traffic Control, vehicle traffic or aircraft.

#### Vehicle and Pedestrian Operations

Vehicle Identification: While working within the AOA, the Contractor shall do the following:

- Each motorized vehicle operating within the AOA shall have a 3-foot square flag consisting of international orange and white squares in full view above the vehicle and/or a rotating yellow beacon. For fabric color specifications, see current FAA Advisory Circular 150/5210-5D, Appendix A.
- Each vehicle shall have Contractor's name clearly identified on both sides of the vehicle, readable from 50'.
- The Contractor shall provide a daily list, prior to start of work, of the expected construction and material delivery vehicles to the construction gate guard, if applicable.
- Contractor vehicles shall yield right-of-way to aircraft and emergency vehicles. Contractor shall ensure that under no circumstances will any contractor or subcontractor or other vehicle associated with the job come within 25 feet of an aircraft, or block the access to any parking gate or delay any aircraft movement.
- Vehicles shall remain within established haul routes. It is prohibited to use runways or taxiways or adjacent field areas unless specifically authorized.

All incoming vehicles to the AOA are subject to inspection. If the United States Department of Homeland Security raises the National Terrorism Advisory System security threat level to "elevated" or "imminent", or if otherwise required at any time by the Airport, or FAA, trained Contractor- supplied security guard personnel, approved and accepted by the Airport, shall search all vehicles entering the AOA.

<u>Vehicle operator training</u>: Vehicles and equipment may only enter the airport operations area (AOA) through the identified access gates. Contractor's supervisor(s) and personnel, operating vehicles or equipment, shall be required to successfully complete the airport's driver's training program before being allowed to drive within the active AOA. Time and expenses for driving classes shall be at the contractor's expense. At a minimum, the contractor's project manager, safety officer, and site superintendent are required to complete the Airport's computer-based non-movement area and movement area driver's training program as well as a practical driving test with the Assistant Airport Manager or their designee.

Contractor shall maintain airfield security and gate security at all times. No access gates shall remain open without contractor provided gate guard.

Escorts are only allowed to monitor two vehicles at a time, unless otherwise approved by Airport Operations.

The Contractor Staging Area, as depicted on the contract drawings, shall be used to store all idle equipment, supplies and construction materials. Storage shall not interfere with operational areas. When not in use during working hours, and at all other times, all material and equipment shall be stored at the storage site indicated on the drawings unless prior approval is provided by the Airport. No materials may be stored on the Aircraft Operating Area (AOA) unless authorized by the Airport.

Speed limit on haul routes and active aprons is 15 mph unless otherwise posted.

The Contractor's equipment, vehicles and materials are strictly restricted to the storage/staging areas during non-working hours unless otherwise approved by the Airport.

#### 6. WILDLIFE MANAGEMENT

Although the responsibility of wildlife management and any necessary removal for the Airport resides with Metropolitan Topeka Airport Authority, the Contractor shall contact Airport Operations immediately in the event that wildlife is observed.

#### <u>Trash</u>

The Contractor will observe strict adherence to site cleanliness. The Contractor shall maintain a clean worksite, clear of excess debris and trash, food garbage or other nuisance attractants. Trash is considered a hazard in that it may become windblown and become Foreign Object Debris (FOD); or it may attract unwanted wildlife which may present serious hazards to aircraft in the AOA.

#### Standing Water

The Contractor will be required to use temporary pumps, as needed, to provide drainage to any excavation areas in order to protect exposed base or subgrade materials from over-saturation and weakening. The Contractor will be required to spray work areas frequently throughout the project to keep down dust and windblown irritants from the work site onto the airfield, out of the AOA, or off airport-property. Water sprayed for dust control may accumulate and must be managed. The Contractor may employ the use of temporary ditches in excavation areas to allow positive drainage and minimize standing water. Standing water is considered a hazard in that it may attract unwanted wildlife which may present serious hazards to aircraft in the AOA.

#### Tall Grass and Seeds

Tall grass and seeds: The airport is regularly maintained for vegetation (mowing, weed removal, etc.). These maintenance items are regularly scheduled and the airport will continue them indefinitely. Project will disturb some areas usually mowed by the airport. Contractor shall mow all areas immediately adjacent to the work zones at a width of 30 feet from disturbed area. No direct payment shall be made for this mowing and this work shall be considered subsidiary to overall project contract.

#### Poorly Maintained Fencing and Gates

The Contractor shall maintain, in good working order, any gate he uses for site access. Additionally, the Contractor will be required to strictly follow airport security protocols for keeping the airfield secure at all times as well as for entering/exiting the AOA.

#### Disruption of Existing Wildlife Habitat

No known habitat disruption should occur and no known issues are anticipated.

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### 7. FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT

A minimum of one sweeper shall be on-site and operational at all times. The broom shall not be comprised of steel bristles. Contractor shall maintain effective control of FOD at all times and prior to opening aprons, taxiways and runways to aircraft. Contractor shall have a mechanized broom dedicated for the exclusive use of cleaning and removing FOD from the aprons, runways and taxiways. The access route across the taxilane north of the t-hangars (and any used taxiways and runways, and apron) shall be swept daily or as needed to pick up FOD, loose debris, mud, dirt or other objects from the access route. The Contractor shall be responsible for immediately cleaning up any FOD generated from construction activities from all active taxiways, aircraft movement areas and runway safety areas. The Contractor shall be responsible for cleaning up any FOD generated from construction activities from all active taxiways and taxiways being reopened to traffic.

The Contractor shall control dust and debris that results from his operations. Waste and loose materials shall not be placed in active movement areas. Materials tracked onto these areas must be removed continually during the course of the project.

### 8. HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT

The Contractor shall be required to submit a safety and health plan, which details how their company manages and handles hazardous materials, for circumstances which may occur on this project. All lubricating liquids and solids (oils and greases) shall be secured and contained in dry areas until used by trained personnel or mechanics. All waste material shall be properly disposed of in accordance with all applicable environmental laws and according to manufacturer's directions. Construction fuel shall not be stored at the site. Excess material from the existing system removal shall be legally disposed of off airport property.

If hazardous materials are encountered on the site which are impacted by the work, the Contractor must notify Airport Operations, Airport Environmental and the Project Design Engineer immediately of their presence.

### 9. NOTIFICATION OF CONSTRUCTION ACTIVITIES

#### Maintenance of a List of Responsible Representatives or Points of Contact

The list of representatives and their contact information (24 hour contact information is required) from the Airport, the Tower, the Contractor and all other associated parties will be maintained and kept current at all times. The Contractor must provide a minimum of 2 management employees available 24/7. This list will initially be distributed at the pre-construction meeting prior to the Notice-to-Proceed for construction and will be updated weekly, as necessary, at the weekly progress status meetings (or more frequent if required).

### Notice to Air Missions (NOTAM)

Appropriate notices to airmen (NOTAMs) must be issued prior to commencing work activities in the vicinity of aircraft operation areas. Contractor shall coordinate work activities and project schedule with the metropolitan Topeka airport authority (MTAA) at least two weeks prior to each change in construction phasing. MTAA shall coordinate issuance of NOTAMs based upon information supplied by

the Contractor. MTAA shall issue NOTAMs and confirm that NOTAMs have been published. Prior to moving into aircraft movement areas to erect traffic control, confirmation of issuance of NOTAMs with air traffic control tower shall be made while securing permission to enter aircraft movement areas.

#### Emergency Notification Procedures

<u>Identification and qualifications of a dedicated security and safety point of contact</u> - The Contractor shall identify a qualified, dedicated safety and security point of contact that is approved by the Airport.

<u>24 hour emergency contacts for police, fire, medical response, and key project personnel</u> – The Contractor will produce an emergency contact list within seven (7) days following the pre-construction meeting. At a minimum, the following emergency contacts shall be included on the contact list:

CALL 911 FOR EMERGENCIES - FIRE / MEDICAL ASSISTANCE CALL 785-862-1130 FOR SECURITY RELATED ISSUES							
AGENCY	NAME	TITLE	PHONE				
METROPOLITAN TOPEKA AIRPORT AUTHORITY	SAFETY DEPARTMENT	EMERGENCY CALLS ONLY - POLICE & FIRE	(785) 862-1130	W			
METROPOLITAN TOPEKA AIRPORT AUTHORITY	ERIC M. JOHNSON	PRESIDENT & DIRECTOR OF AIRPORTS	(785) 862-2362	W			
METROPOLITAN TOPEKA AIRPORT AUTHORITY	BILL WEMPE	COLONEL SAFETY DEPARTMENT	(785) 862-9250	W			
METROPOLITAN TOPEKA AIRPORT AUTHORITY	RITA EGGENBERGER	OPERATIONS OFFICER	(785) 862-0711	W			
METROPOLITAN TOPEKA AIRPORT AUTHORITY	TERRY POLEY	DIRECTOR OF MAINTENANCE	(785) 862-0711 (785) 633-9957	W C			
METROPOLITAN TOPEKA AIRPORT AUTHORITY	MATT ANSTAETT	DEPUTY DIRECTOR OF MAINTENANCE	(785) 862-0711 (785) 633-0759	W C			
MIDWEST AIR TRAFFIC CONTROL SERVICES	JOHN WOOTEN	AIR TRAFFIC CONTROL TOWER MANAGER	(785) 862-2058	W			
WSP USA INC	SAM STALLBAUMER, PE	OWNER'S REPRESENTATIVE	(816) 702-4244 (210) 867-6532	W C			
ARGUS CONSULTING	GARRETT GJERSTAD, PE	OWNER'S REPRESENTATIVE	(816) 874-8236 (210) 260-3542	W			
CONTRACTOR		PROJECT MANAGER		W C			
CONTRACTOR		PROJECT SUPERINTENDENT		W C			

#### Coordination with ARFF Personnel

The Airport maintains an Air Rescue Fire Fighting (ARFF) emergency response team. ARFF emergency and non-emergency phone numbers should be listed on the Emergency Contact List, provided by the Contractor, for any coordination that may be necessary between the Contractor and ARFF. The Contractor shall have reference to this Emergency Contact List at all times.

#### Notification to the FAA

The Contractor will be required to coordinate directly with the Owner as needed who will coordinate directly with the tower (Air Traffic Control Tower or ATCT). The tower is operational from 0545 hours to 2200 hours on a daily basis.

FAA Form 7460-1, Notice of Proposed Construction or Alteration, is not required to be submitted to the FAA for vehicles or construction equipment 15-feet in height or less. If the Contractor chooses to use vehicles or equipment in excess of this height, the Contractor shall be responsible for submitting for an airspace analysis (FAA Form 7460-1). The Contractor is advised that the FAA review may take up to 90 days from the time of submittal. The Contractor will be responsible for all costs and time delays associated with the 7460-1 application.

#### **10. INSPECTION REQUIREMENTS**

The Contractor shall provide unencumbered access to FAA, Airport, and Project Design Engineer of the work areas at all times. The Contractor shall include sufficient time within the allowable closure requirements to accommodate inspections and acceptance of work by Airport, FAA and Project Design Engineer.

#### Daily (or more frequent) Inspections

The Contractor is responsible for Quality Control inspection of their own work, as well as for all safety requirements for the project. The Contractor is required to adhere to the Contract Documents, which include all safety requirements of this Safety and Phasing Plan.

The Contractor shall identify, in writing to the Airport and Project Design Engineer, the individuals responsible for conducting inspections prior to the inspection taking place.

The Contractor shall complete a daily inspection of the work site for safety by completing the checklist attached to the specifications in Appendix 2 (AC 150/5370-2 current edition, Appendix D). The Contractor shall include sufficient time within the allowable closure requirements to accommodate inspections and acceptance of work by the Airport, FAA and Project Design Engineer.

It is the Contractor's responsibility to address construction safety issues adjacent or incidental to the project, even if they are not directly related to this project.

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### Final Inspections

Any damage along the haul routes shall be repaired by the Contractor prior to the completion of the phase for which the route is used. All haul routes and work areas shall be inspected by Contractor/Owner's Representative/MTAA prior to any pavement section being re-opened to aircraft or the traveling public. The Contractor shall perform a final inspection of all haul routes near the completion of phase 2 with any defects being repaired as being a condition for substantial completion for the project.

### **11. UNDERGROUND UTILITIES**

### Procedure for locating and protecting existing underground utilities, cables and wires:

The Contractor shall be responsible for the protection of existing pavements, turfed areas, underground pipes and utilities, and all other existing features unless otherwise noted on these plans. The Contractor will repair to original conditions all features including existing pavements and turfed areas disturbed by their activities to the satisfaction of the Airport, FAA Technical Operations Manager, and Project Design Engineer. This repair will be considered incidental to the work and no additional compensation shall be made for it.

### 12. PENALTIES

In the event an employee of the Contractor violates a safety provision, they shall be prohibited from returning to work on the AOA. Violations will be deemed as just and sufficient cause to require the employee be permanently removed from the job site.

The Contractor shall be responsible for all costs and delays caused by safety violation. Construction personnel driving erratically on the airport, exceeding the 15 mph speed limit, or violating any other Airport driving rule or safety regulation, at a minimum, shall be removed from the project permanently. Airport Operations can remove any Contractor personnel, at any time, due to a safety violation. Airport Operations shall report any occurrences to the Contractor and the Airport.

Non-compliance by the Contractor with airport rules and regulations or failure to comply with the approved CSPP and SPCD, airport security regulations, vehicle speed restrictions and any other applicable airport regulation will result in the removal of the contractor personnel from the work site and may result in fines as allowed by law as well.

#### Liquidated Damages

Should the contractor exceed the allowable number of calendar days to complete the work, a liquidated damage in the amount shown below may be applied to the contract in damages.

a. Work not completed within the three hundred (300) consecutive calendar day period will be assessed \$3,600 per day liquated damages.

### **13. SPECIAL CONDITIONS**

Emergency situations: Should a life-threatening injury occur on site, whether it be to the Contractor's workforce or Airport's inspection crew or others, the Airport shall be immediately notified, and he/she will notify the appropriate Airport departments. The Contractor shall follow all instructions by the Airport, Airport Operations and Airport/FAA officials or their designees.

The Contractor shall yield to all safety personnel. In the event of a work stoppage due to aircraft emergency, the contractor shall, if possible, make safe the construction site and vacate the area under escort.

The Contractor shall take full responsibility of the safety of workers throughout the construction site and for the entire duration of the project. In particular, the Contractor shall be aware of aircraft activity on the airport and fully acquaint himself with the dangers of jet blast and its effect on work in adjacent areas, especially in non-movement areas. Material capable of being displaced shall not be stockpiled or stored without being secured in work areas adjacent to active aircraft operational areas.

### 14. RUNWAY AND TAXIWAY VISUAL AIDS

#### <u>General</u>

Closures will be noted with the use of low profile, lighted barricades weighted with sandbags at runway and taxiway crossings. Barricades should be secured to prevent movement from jet blast. The Airport will provide NOTAMs for closures and the Contractor will be required to provide, place and maintain temporary barricades at clearly visible locations to keep pilots from errantly taxiing down a closed taxiway or closed runway. Low profile, lighted barricades weighted with sandbags are to be placed at the TSA boundary, outside the safety area.

#### Markings

No pavement markings shall be removed for this work. No temporary pavement markings shall be necessary.

#### Lighting and Visual NAVAID's

No lighting or visual NAVAID's will be impacted by the project. Contractor shall take extreme care when driving between taxiway lights. Any damage to taxiway lights caused by the contractor, will be repaired by the contractor to the satisfaction of the Airport, and Project Design Engineer. This repair will be considered incidental to the work and no additional compensation shall be made for it.

### <u>Signs</u>

No signs will be impacted by the project.

### 15. MARKING AND SIGNS FOR ACCESS ROUTES

Contractor must clearly mark all access and haul routes and install signage in accordance with current FAA AC 150/5345-44 current edition "*Specification for Runway and Taxiway Signs*", AC 150-5340-18 current edition.

### 16. HAZARD MARKING AND LIGHTING

#### <u>General</u>

The Contractor is responsible for replacing in-kind any markings destroyed, obliterated, or otherwise rendered unusable by construction activities.



#### <u>Equipment</u>

All construction vehicles and equipment shall have a rotating yellow beacon and/or 3 feet by 3 feet checkered orange and white flag attached to vehicles/equipment as specified in AC 150/5210-5 current edition *"Painting, Marking, and Lighting of Vehicles Used on An Airport"*.

Barricades shall be low-profile with red flashing lights. Facing of barricades to be covered with reflective material consisting of white and safety orange stripes.

### 17. WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION (IF APPLICABLE)

Lighting equipment must adequately illuminate the work area if construction is to be performed during nighttime hours. It is recommended that all support equipment, except haul trucks, be equipped with artificial illumination to safely illuminate the area immediately surrounding their work areas.

Light should be positioned to provide the most natural color illumination and contrast with a minimum of shadows. The spacing must be determined by trial. Light towers should be positioned and adjusted to aim away from ATCT cabs and active runways to prevent blinding effects. Shielding may be necessary.

#### **18. PROTECTION**

#### Runway Safety Area (RSA)

There shall be no work within any active RSA. The Contractor is not permitted to work within the RSA of an active runway.

#### Runway Object Free Area (ROFA)

There shall be no work within any ROFA. The Contractor is not permitted to work within the ROFA of an active runway.

#### Taxiway Safety Area (TSA)

Provide details for any adjustments to Taxiway Safety Area width to allow continued operation of smaller aircraft: No impacts to Taxiway Safety Areas (TSA) are anticipated as part of this project.

#### Taxiway Object Free Area (TOFA)

Provide details for any continued aircraft operations while construction occurs within the TOFA: No impact to Taxiway Object Free Areas is anticipated as part of this project.

#### Obstacle Free Zones (OFZ)

There will be no work within any active Obstacle Free Zone (OFZ).

#### Runway Approach/Departure Surfaces

There will be no work within any active Runway Approach/Departure Areas or Clearways.

Zone Description	ption Acronym		Dist from Centerline
Runway Safety Area	RSA	500	250
Runway Object Free Area	ROFA	800	400
Taxiway Safety Area *	TSA	171	85.5
Taxiway Object Free Area *	TOFA	259	129.5
Obstacle Free Zone	OFZ	400	200

* Aircraft Design Group (ADG) IV

#### **19. OTHER LIMITATIONS ON CONSTRUCTION**

The following restrictions will be in place during the construction of this project unless otherwise accepted by written authorization:

- No use of equipment over 15 feet tall (cranes, concrete pumps, and so on) unless a 7460-1 determination letter is used for such equipment.
- No use of open flames welding or torches unless adequate fire safety precautions are provided and approved in writing by the Airport.
- No use of flare pots within the AOA at any time.
- No use of electrical blasting caps on or within 1,000 feet of airport property.
- No smoking within the Airport facilities or within 20 feet of entrances, operable windows, or outdoor air intakes. Smoking on the Air Operations Area (AOA) is not allowed.
- No disruption of utilities serving the facilities occupied by the Airport or their tenants, unless
  permitted in writing (with provisions for temporary utilities in their place). Notify the Airport
  and Airport a minimum of 48 hours in advance of proposed utility disruptions and do not
  proceed with utility interruption without written permission.
- Use of flood lighting for night-time work must be limited to non-directional light. Lights cannot be pointed at the tower or pointed toward the airfield or runway approaches. Lights that cause glare or blind spots to the tower or to pilots will not be allowed.
- Contractor should be aware of jet blast at all times, especially while around active runways, taxiways and aprons. Barricades should be weighted with sandbags to prevent movement due to jet blast. Stockpiles and construction equipment should be kept away from places where jet blast is likely to occur (run-up aprons, taxiway corners, etc.)
- Contractor's working days or times may be limited at the Airport's discretion due to VIP aircraft, special operations, or special events.

## **APPENDIX 1**

# SAFETY AND PHASING PLAN CHECKLIST 150/5370-2G, APPENDIX C

### APPENDIX C. SAFETY AND PHASING PLAN CHECKLIST

This appendix is keyed to <u>Chapter 2</u>. In the electronic version of this AC, clicking on the paragraph designation in the Reference column will access the applicable paragraph. There may be instances where the CSPP requires provisions that are not covered by the list in this appendix.

This checklist is intended as an aid, not a required submittal.

Coordination	Reference	Addressed?		Remarks				
		Yes	No	NA				
General Considerations								
Requirements for predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction are specified.	<u>2.5</u>							
Operational safety is a standing agenda item for construction progress meetings.	<u>2.5</u>							
Scheduling of the construction phases is properly addressed.	<u>2.6</u>							
Any formal agreements are established.	<u>2.5.3</u>							
Areas and Operation	ons Affected by C	onstruction A	ctivity					
Drawings showing affected areas are included.	<u>2.7.1</u>							
Closed or partially closed runways, taxiways, and aprons are depicted on drawings.	<u>2.7.1.1</u>							
Access routes used by ARFF vehicles affected by the project are addressed.	<u>2.7.1.2</u>							
Access routes used by airport and airline support vehicles affected by the project are addressed.	2.7.1.3							
Underground utilities, including water supplies for firefighting and drainage.	2.7.1.4							

#### Table C-1. CSPP Checklist

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Approach/departure surfaces affected by heights of temporary objects are addressed.	<u>2.7.1.5</u>				
Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads are properly depicted on drawings.	<u>2.7.1</u>				
Temporary changes to taxi operations are addressed.	<u>2.7.2.1</u>				
Detours for ARFF and other airport vehicles are identified.	<u>2.7.2.2</u>				
Maintenance of essential utilities and underground infrastructure is addressed.	<u>2.7.2.3</u>				
Temporary changes to air traffic control procedures are addressed.	2.7.2.4				
	NAVAIDs				
Critical areas for NAVAIDs are depicted on drawings.	<u>2.8</u>				
Effects of construction activity on the performance of NAVAIDS, including unanticipated power outages, are addressed.	<u>2.8</u>				
Protection of NAVAID facilities is addressed.	<u>2.8</u>				
The required distance and direction from each NAVAID to any construction activity is depicted on drawings.	<u>2.8</u>				
Procedures for coordination with FAA ATO/Technical Operations, including identification of points of contact, are included.	<u>2.8, 2.13.1,</u> <u>2.13.5.3.1,</u> <u>2.18.1</u>				
	Contractor Acces	S			
The CSPP addresses areas to which contractor will have access and how	<u>2.9</u>				

Coordination	Reference	Addressed?		Remarks		
		Yes	No	NA		
the areas will be accessed.						
The application of 49 CFR Part 1542 Airport Security, where appropriate, is addressed.	<u>2.9</u>					
The location of stockpiled construction materials is depicted on drawings.	<u>2.9.1</u>					
The requirement for stockpiles in the ROFA to be approved by FAA is included.	<u>2.9.1</u>					
Requirements for proper stockpiling of materials are included.	<u>2.9.1</u>					
Construction site parking is addressed.	<u>2.9.2.1</u>					
Construction equipment parking is addressed.	<u>2.9.2.2</u>					
Access and haul roads are addressed.	<u>2.9.2.3</u>					
A requirement for marking and lighting of vehicles to comply with <u>AC 150/5210-5</u> , <i>Painting, Marking</i> <i>and Lighting of Vehicles Used on an</i> <i>Airport</i> , is included.	<u>2.9.2.4</u>					
Proper vehicle operations, including requirements for escorts, are described.	<u>2.9.2.5, 2.9.2.6</u>					
Training requirements for vehicle drivers are addressed.	<u>2.9.2.7</u>					
Two-way radio communications procedures are described.	<u>2.9.2.9</u>					
Maintenance of the secured area of the airport is addressed.	<u>2.9.2.10</u>					
Wildlife Management						
The airport operator's wildlife management procedures are addressed.	<u>2.10</u>					

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Foreign	Dbject Debris Ma	nagement			
The airport operator's FOD management procedures are addressed.	<u>2.11</u>				
Hazardo	ous Materials Mai	nagement			
The airport operator's hazardous materials management procedures are addressed.	<u>2.12</u>				
Notificatio	on of Construction	n Activities			
Procedures for the immediate notification of airport user and local FAA of any conditions adversely affecting the operational safety of the airport are detailed.	<u>2.13</u>				
Maintenance of a list by the airport operator of the responsible representatives/points of contact for all involved parties and procedures for contacting them 24 hours a day, seven days a week is specified.	<u>2.13.1</u>				
A list of local ATO/Technical Operations personnel is included.	<u>2.13.1</u>				
A list of ATCT managers on duty is included.	<u>2.13.1</u>				
A list of authorized representatives to the OCC is included.	<u>2.13.2</u>				
Procedures for coordinating, issuing, maintaining and cancelling by the airport operator of NOTAMS about airport conditions resulting from construction are included.	<u>2.8, 2.13.2,</u> <u>2.18.3.3.9</u>				
Provision of information on closed or hazardous conditions on airport movement areas by the airport operator to the OCC is specified.	2.13.2				
Emergency notification procedures for medical, fire fighting, and police	2.13.3				

Coordination	Reference	Addressed?		Remarks		
		Yes	No	NA		
response are addressed.						
Coordination with ARFF personnel for non-emergency issues is addressed.	<u>2.13.4</u>					
Notification to the FAA under 14 CFR parts 77 and 157 is addressed.	<u>2.13.5</u>					
Reimbursable agreements for flight checks and/or design and construction for FAA owned NAVAIDs are addressed.	2.13.5.3.2					
Inspection Requirements						
Daily and interim inspections by both the airport operator and contractor are specified.	<u>2.14.1, 2.14.2</u>					
Final inspections at certificated airports are specified when required.	<u>2.14.3</u>					
U	nderground Utilit	ties				
Procedures for protecting existing underground facilities in excavation areas are described.	<u>2.15</u>					
	Penalties					
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	<u>2.16</u>					
	Special Condition	IS	-	-		
Any special conditions that affect the operation of the airport or require the activation of any special procedures are addressed.	<u>2.17</u>					
Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs						
The proper securing of temporary airport markings, lighting, signs, and visual NAVAIDs is addressed.	<u>2.18.1</u>					
Frangibility of airport markings, lighting, signs, and visual NAVAIDs is specified.	<u>2.18.1, 2.18.3,</u> <u>2.18.4.2,</u> <u>2.20.2.4</u>					

Coordination	Reference	Addressed?		Remarks		
		Yes	No	NA		
The requirement for markings to be in compliance with <u>AC 150/5340-1</u> , <i>Standards for Airport Markings</i> , is specified.	<u>2.18.2</u>					
Detailed specifications for materials and methods for temporary markings are provided.	<u>2.18.2</u>					
The requirement for lighting to conform to <u>AC 150/5340-30</u> , <i>Design</i> and Installation Details for Airport Visual Aids; <u>AC 150/5345-50</u> , Specification for Portable Runway and Taxiway Lights; and <u>AC</u> <u>150/5345-53</u> , Airport Lighting Certification Program, is specified.	<u>2.18.3</u>					
The use of a lighted X is specified where appropriate.	<u>2.18.2.1.2,</u> <u>2.18.3.2</u>					
The requirement for signs to conform to <u>AC 150/5345-44</u> , Specification for Runway and Taxiway Signs; AC 50/5340-18, Standards for Airport Sign Systems; and <u>AC 150/5345-53</u> , Airport Lighting Certification Program, is specified.	<u>2.18.4</u>					
Marking a	and Signs For Acc	cess Routes				
The CSPP specifies that pavement markings and signs intended for construction personnel should conform to <u>AC 150/5340-18</u> and, to the extent practicable, with the MUTCD and/or State highway specifications.	<u>2.18.4.2</u>					
Hazard Marking and Lighting						
Prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles are specified.	<u>2.20.1</u>					

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Hazard marking and lighting are specified to identify open manholes, small areas under repair, stockpiled material, and waste areas.	<u>2.20.1</u>				
The CSPP considers less obvious construction-related hazards.	<u>2.20.1</u>				
Equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast is specified.	<u>2.20.2.1</u>				
The spacing of barricades is specified such that a breach is physically prevented barring a deliberate act.	<u>2.20.2.1</u>				
Red lights meeting the luminance requirements of the State Highway Department are specified.	<u>2.20.2.2</u>				
Barricades, temporary markers, and other objects placed and left in areas adjacent to any open runway, taxiway, taxi lane, or apron are specified to be as low as possible to the ground, and no more than 18 inch high.	<u>2.20.2.3</u>				
Barricades are specified to indicate construction locations in which no part of an aircraft may enter.	<u>2.20.2.3</u>				
Highly reflective barriers with lights are specified to barricade taxiways leading to closed runways.	<u>2.20.2.5</u>				
Markings for temporary closures are specified.	<u>2.20.2.5</u>				
The provision of a contractor's representative on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades is specified.	2.20.2.7				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
Work Zone Lig	hting for Nighttin	ne Constructio	on		
If work is to be conducted at night, the CSPP identifies construction lighting units and their general locations and aiming in relationship to the ATCT and active runways and taxiways.	2.21				
Protection of R	unway and Taxiw	yay Safety Are	as		Γ
The CSPP clearly states that no construction may occur within a safety area while the associated runway or taxiway is open for aircraft operations.	<u>2.22.1.1</u> , <u>2.22.3.1</u>				
The CSPP specifies that the airport operator coordinates the adjustment of RSA or TSA dimensions with the ATCT and the appropriate FAA Airports Regional or District Office and issues a local NOTAM.	<u>2.22.1.2,</u> <u>2.22.3.2</u>				
Procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations, are detailed.	<u>2.22.3.3</u>				
The CSPP specifies that open trenches or excavations are not permitted within a safety area while the associated runway or taxiway is open, subject to approved exceptions.	<u>2.22.1.4</u>				
Appropriate covering of excavations in the RSA or TSA that cannot be backfilled before the associated runway or taxiway is open is detailed.	<u>2.22.1.4</u>				
The CSPP includes provisions for prominent marking of open trenches and excavations at the construction site.	2.22.1.4				
Grading and soil erosion control to maintain RSA/TSA standards are	<u>2.22.3.5</u>				

Coordination	Reference	Addressed?		Remarks	
		Yes	No	NA	
addressed.					
The CSPP specifies that equipment is to be removed from the ROFA when not in use.	<u>2.22.2</u>				
The CSPP clearly states that no construction may occur within a taxiway safety area while the taxiway is open for aircraft operations.	2.22.3				
Appropriate details are specified for any construction work to be accomplished in a taxiway object free area.	<u>2.22.4</u>				
Measures to ensure that personnel, material, and/or equipment do not penetrate the OFZ or threshold siting surfaces while the runway is open for aircraft operations are included.	<u>2.22.4.3.6</u>				
Provisions for protection of runway approach/departure areas and clearways are included.	2.22.6				
Other Limitations on Construction					
The CSPP prohibits the use of open flame welding or torches unless adequate fire safety precautions are provided and the airport operator has approved their use.	<u>2.23.1.2</u>				
The CSPP prohibits the use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.	<u>2.23.1.3</u>				

## **APPENDIX 2**

# CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST 150/5370-2G, APPENDIX D

#### APPENDIX D. CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project including information such as the date, time and name of the person conducting the inspection.

Item	Action Required (Describe)	No Action Required (Check)
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.		
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.		
Runway resurfacing projects resulting in lips exceeding 3 inch (7.6 cm) from pavement edges and ends.		
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.		
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.		
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and		

#### **Table D-1. Potentially Hazardous Conditions**

Item	Action Required (Describe)	No Action Required (Check)
approach zones.		
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.		
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.		
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.		
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.		
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.		
Obliterated or faded temporary markings on active operational areas.		
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.		

Item	Action Required (Describe)	No Action Required (Check)
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.		
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.		
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.		
Lack of radio communications with construction vehicles in airport movement areas.		
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.		
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.		
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.		
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).		

Item	Action Required (Describe)	No Action Required (Check)
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.		
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.		
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.		
Site burning, which can cause possible obscuration.		
Construction work taking place outside of designated work areas and out of phase.		

## **APPENDIX 3**

## CONSTRUCTION SAFETY AND PHASING PLANS

LEGEND			
	WORK AREA		ACCESS/HAUL ROUTE
	CONTRACTOR STAGING AREA	00000 (	LOW PROFILE BARRICADE
		RSA	RUNWAY SAFETY AREA
		— ROFA —	RUNWAY OBJECT FREE AREA
*	FLAGPERSON		TAXIWAY SAFETY AREA
X TAXIWAY CLOSURE MARKER	— TOFA —	TAXIWAY OBJECT FREE AREA	

ZONE DESCRIPTION	ACRONYM	TOTAL WIDTH (FT.)	DIST FROM € (FT.)
RUNWAY SAFETY AREA	RSA	500	250
RUNWAY OBJECT FREE AREA	ROFA	800	400
TAXIWAY SAFETY AREA	TSA	171	85.5
TAXIWAY OBJECT FREE AREA	TOFA	259	129.5
OBSTACLE FREE ZONE	OFZ	400	200

#### GENERAL NOTES:

1. COORDINATION

- THE CONTRACTOR SHALL PROVIDE A PROJECT SUPERINTENDENT WHO SHALL BE ON THE PROJECT SITE AT ALL TIMES WHILE WORK IS BEING PERFORMED TO SUPERVISE AND DIRECT THE CONSTRUCTION. THE PROJECT SUPERINTENDENT SHALL SERVE AS THE ON-PROJECT SAFETY COORDINATOR FOR THE CONTRACTOR AND BE EQUIPPED WITH A RADIO CAPABLE OF COMMUNICATING WITH THE AIR TRAFFIC CONTROL TOWER (ATCT) FOR THE PURPOSES OF RECEIVING INSTRUCTIONS AND OBTAINING CLEARANCES AS NEEDED. THIS RADIO IS FOR THE PROJECT SUPERINTENDENT'S EXCLUSIVE USE ONLY AND SHALL BE ON HIS PERSON AT ALL TIMES. THE SUPERINTENDENT SHALL BE THE 24 HOUR ON-CALL REPRESENTATIVE FOR EMERGENCY SITUATIONS. THE PROJECT SUPERINTENDENT SHALL BE RESPONSIBLE FOR SECURING PERMISSION FROM THE ATCT FOR CONSTRUCTION VEHICLES TO ENTER INTO AIRCRAFT MOVEMENT AREAS, WHEN NECESSARY, AND TO COMMUNICATE WITH THE ATCT DURING THE CONSTRUCTION FOR THE PROJECT. CONTRACTOR SHALL NOT ACCESS AIRCRAFT MOVEMENT AREAS WHEN NECESSARY, AND TO COMMUNICATE WITH THE ATCT DURING THE CONSTRUCTION FOR THE PROJECT. CONTRACTOR SHALL NOT ACCESS AIRCRAFT MOVEMENT AREAS WHEN NECESSARY, AND TO COMMUNICATE WITH THE ATCT DURING THE CONSTRUCTION FOR THE PROJECT. CONTRACTOR SHALL NOT ACCESS AIRCRAFT MOVEMENT AREAS WHEN NECESSARY, AND TO COMMUNICATE WITH THE ATCT DURING THE CONSTRUCTION FOR THE PROJECT. CONTRACTOR SHALL NOT ACCESS AIRCRAFT MOVEMENT AREA WITHOUT TOWER PERMISSION, GROUND CONTROL RADIO FREQUENCY IS 118.425 MHZ. TOWER CONTROL RADIO FREQUENCY IS 120.80 MHZ. GOUND FREQUENCY TO BE USED FOR A MAJORITY OF THE OPERATIONS. TOWER CONTROL FREQUENCY TO BE USED FOR A MAJORITY OF THE OPERATIONS. TOWER CONTROL FREQUENCY TO BE USED FOR A MAJORITY OF THE OPERATIONS. TOWER CONTROL FREQUENCY TO BE USED WHEN OCCUPYING A RUNWAY OPEN TO AIR TRAFFIC.
- CONTRACTOR SUPERINTENDENT SHALL BE RESPONSIBLE FOR COMMUNICATING WITH THE ATCT IN THE EVENT THAT ACCESS TO AIRCRAFT MOVEMENT AREAS BECOME NECESSARY AND TO RECEIVE SPECIAL INSTRUCTIONS FROM THE ATCT IN THE CASE OF AN EMERGENCY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING MOVEMENT OF WORKERS WITHIN THE AIRCRAFT OPERATIONS
   AREA, THE DELIVERY OF MATERIALS TO THE PROJECT SITE AND THE ESCORTS FOR THOSE VEHICLES ONTO AND FROM THE
   PROJECT SITE THROUGH THE AIRCRAFT OPERATIONS AREA. ESCORT VEHICLES SHALL BE REQUIRED TO HAVE RADIO
   COMMUNICATION WITH THE TOWER AT ALL TIMES (SUPERINTENDENT'S RADIO IS NOT TO BE USED BY ESCORT VEHICLES). ALL
   WORK ASSOCIATED WITH PROJECT WILL BE PERFORMED AS BID AND TO THE LIMITS INDICATED BELOW.
- ACCESS ROUTES FROM AND THROUGH THE RAMP AREA AND FAA ACCESS ROADWAYS SHALL BE ADEQUATELY DELINEATED WITH CONES AND/OR BARRICADES TO MARK TRAVEL ROUTES FOR DELIVERY VEHICLES AND TO PREVENT VEHICLES FROM STRAYING FROM DESIGNATED TRAVEL ROUTES.
- TRAFFIC CONTROL DEVICES SHALL BE ERECTED TO CONTROL CONSTRUCTION TRAFFIC TO ONE AREA OF EXISTING TAXIWAYS
   AND RUNWAYS TO BE UTILIZED AS ACCESS ROADWAYS, MAXIMUM PATHWAY WIDTH IS 30'.
- SPEED LIMIT ON HAUL ROUTES, ACTIVE APRONS AND TAXIWAYS AND RUNWAYS IS 20 MPH UNLESS OTHERWISE POSTED.
- CONTRACTOR'S PERSONNEL WILL BE ALLOWED TO PARK PERSONAL VEHICLES IN AND ALL CONSTRUCTION EQUIPMENT IN THE
   CONTRACTOR STAGING AREA.
- CONTRACTOR SHALL MAINTAIN CONTROL OF EQUIPMENT AND PERSONNEL AND PREVENT THE MOVEMENT OF THE SAME OUTSIDE OF THE PROJECT LIMITS AND/OR THROUGH ACTIVE AIRCRAFT OPERATION AREAS. ACTIVE AIRCRAFT OPERATION AREAS INCLUDE TAXIWAYS AND RUNWAYS NOT CLOSED DUE TO THE PROJECT REQUIREMENTS. FOR EXAMPLE, WHILE AIRCRAFT MAY BE MOVING ALONG OPEN TAXIWAYS AND PORTIONS OF CLOSED RUNWAY, CONTRACTOR'S PERSONNEL WILL NOT BE PERMITTED TO ACCESS THESE OPEN TAXIWAYS OR RUNWAYS WITHOUT SECURING PERMISSION FROM THE ATCT. CONTRACTOR EQUIPMENT, VEHICLES, AND PERSONNEL SHALL YIELD TO ALL AIRCRAFT MOVEMENT AND EMERGENCY EQUIPMENT. CONTRACTOR'S EQUIPMENT SHALL BE REMOVED FROM ROFA WHEN NOT IN USE.
- THE NORMAL WORKDAY WILL OCCUR BETWEEN THE HOURS OF 7:00 AM AND 6:00 PM.



#### 1. COORDINATION (CONTINUED)

- A PRE-CONSTRUCTION CONFERENCE WILL BE HELD PRIOR TO THE START OF WORK ON THE PROJECT AT LEAST TWO WEEKS PRIOR TO THE START OF WORK, DURING THE PRE-CONSTRUCTION CONFERENCE, THE CONTRACTOR'S SAFETY PLAN COMPLIANCE DOCUMENT (SPCD) AND THEIR ADHERENCE TO THEIR SAFETY PLAN WILL BE DISCUSSED. REVIEWS OF ADHERENCE TO THE SAFETY PLAN WILL TAKE PLACE DURING CONSTRUCTION PROGRESS MEETINGS.
- PROJECT PROGRESS MEETINGS WILL BE HELD DURING THE COURSE OF CONSTRUCTION, THOSE REQUIRED TO ATTEND THE MEETING WILL INCLUDE THE MTAA. THE RESIDENT PROJECT REPRESENTATIVE (RPR), THE AIR TRAFFIC CONTROL TOWER CHIEF, THE CONTRACTOR (MINIMUM OF THE PROJECT SUPERINTENDENT) AND SUBCONTRACTORS WHO WILL BE PROVIDING WORK DURING THE PERIOD OF TIME BETWEEN THE CURRENT MEETING AND THE NEXT PROJECT PROGRESS MEETING FAA FACILITIES PERSONNEL SAFETY PERSONNEL AND FIXED BASE OPERATORS (FBO) WILL HAVE A STANDING INVITATION TO THESE MEETINGS AND WILL ATTEND AS REQUIRED, OR IF THEY FEEL THEY HAVE A NEED TO BE PRESENT. THE MEETING WILL GENERALLY BE HELD ON A BLWEEKLY BASIS. DEPENDING ON THE CRITICAL ITEMS OF WORK AND MUTUAL AGREEMENT BETWEEN THE MTAA. THE RPR. AND THE CONTRACTOR. MEETING DATES AND TIMES WILL BE ESTABLISHED AT THE PRE-CONSTRUCTION CONFERENCE. MEETING LOCATIONS WILL BE AT THE MTAA MAINTENANCE BUILDING OR OTHER DESIGNATED LOCATIONS AT TOPEKA REGIONAL AIRPORT, TOPEKA, KANSAS

#### 2. PHASING

- SEE SHEET C114 FOR PHASING OF THIS PROJECT.
- RPR AND AIRPORT MANAGER WILL APPROVE A PROPOSED SCHEDULE FOR CONSTRUCTION OF EACH PHASE PRIOR TO ANY CONSTRUCTION
- CONTRACTOR MUST NOTIFY RPR AND AIRPORT MANAGER IF A CHANGE IN SCHEDULE IS NEEDED

#### 3. AREAS AND OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY

 CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS AND SAFETY PRECAUTIONS PRESENTED IN FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR 150/5370-2G, "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION." A COPY OF THE DOCUMENT CAN BE FOUND IN THE PROJECT MANUAL FOR REFERENCE AND USE, OR AT THE FEDERAL AVIATION ADMINISTRATION INTERNET WEB SITE

(HTTPS://WWW.FAA.GOV/AIRPORTS/RESOURCES/ADVISORY_CIRCULARS/INDEX.CFM/GO/DOCUMENT.CURRENT/DOCUMENT NUMBER/150_5370-2).

#### 4. PROTECTION OF NAVIGATIONAL AIDS (NAVAIDS)

• PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL WALK THE PROJECT LIMITS WITH THE OWNER, FAA, AIRWAYS FACILITIES AND AIRPORT OPERATIONS TO IDENTIFY ANY AFFECTED NAVAIDS.

#### 5. CONTRACTOR ACCESS

- ACCESS TO THE WORK AREA AND CONTRACTOR STAGING AREA WILL BE MADE BY MEANS OF SE FORBES AVENUE.
- CONTRACTOR SHALL PROVIDE AN APPROVED GUARD AT ACCESS GATES TO CONTROL THE ACCESS OF CONTRACTOR ONLY PERSONNEL ONTO THE PROJECT SITE DURING THE PROJECT WORK. ACCESS GUARDS SHALL HAVE A RADIO OR CELLULAR TELEPHONE CAPABLE OF COMMUNICATING WITH THE PROJECT SUPERINTENDENT AND SHALL NOTIFY THE PROJECT SUPERINTENDENT IMMEDIATELY OF UNUSUAL CIRCUMSTANCES OF UNAUTHORIZED ENTRIES THROUGH THE GATE CONSTRUCTION TRAFFIC SHALL BE LIMITED TO THE PATHWAYS INDICATED AS THEY HAVE BEEN DEEMED TO FORM THE MOST DIRECT ROUTE FROM THE ACCESS POINT TO THE PROJECT SITE. CONTRACTOR TO PROVIDE BACKGROUND INFORMATION AND EXPERIENCE LEVEL OF GATE GUARDS USED ON THE PROJECT FOR REVIEW AND APPROVAL BY THE AIRPORT OPERATIONS STAFF.
- CONTRACTOR SHALL COORDINATE SECURITY ARRANGEMENTS WITH THE MTAA DURING THE COURSE OF THE PROJECT. CONTRACTOR SHALL BE REQUIRED TO PROVIDE PERSONNEL AT ACCESS POINTS, AS NEEDED, TO CONTROL TRAFFIC ENTERING AND LEAVING THE PROJECT SITE. CONTRACTOR SHALL MEET THE SECURITY REQUIREMENTS ESTABLISHED BY THE APPROPRIATE CONTROLLING BODY AND SHALL BE RESPONSIBLE FOR ENSURING THAT CONTRACTOR'S PERSONNEL AND SUBCONTRACTOR'S PERSONNEL ADHERE TO SUCH REQUIREMENTS.
- CONTRACTOR SHALL MAINTAIN ALL ACCESS ROADS AND SHALL RESTORE TO EXISTING CONDITIONS OR BETTER.
- ALL HIGH PROFILE EQUIPMENT, SUCH AS CRANES, SHALL BE LOWERED TO THE MINIMUM HEIGHT POSSIBLE WHEN NOT IN USE.
- SEE SPECIFICATIONS AND SAFETY PLAN REGARDING ACCESS AND SECURITY ISSUES.
- CONTRACTOR SHALL COORDINATE THE USE OF SEFORBES ROAD WITH THE MTAA. NO PAYMENT FOR MAINTENANCE OF HAUL ROAD WILL BE PROVIDED FOR THIS ROADWAY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE OF ELECTRICAL CABLING ALONG HAUL ROUTES. IN AND AROUND THE WORK AREA. AND IN AND AROUND CONTRACTOR STAGING

#### AREA.

6. WILDLIFE MANAGEMENT

- ALTHOUGH THE RESPONSIBILITY OF WILDLIFE MANAGEMENT AND ANY NECESSARY REMOVAL FOR THE AIRPORT RESIDES WITH METROPOLITAN TOPEKA AIRPORT ALTHORITY THE CONTRACTOR SHALL CONTACT AIRPORT OPERATIONS IMMEDIATELY IN THE EVENT THAT WILDLIFE IS OBSERVED.
- TRASH
- THE CONTRACTOR SHALL OBSERVE STRICT ADHERENCE TO SITE CLEANLINESS, DAILY END OF DAY AS WELL AS PERIODIC THROUGHOUT THE DAY VISUAL INSPECTIONS SHALL BE PERFORMED BY THE CONTRACTOR AND AIRPORT TO ENSURE SITE TRASH IS PICKED UP TO PREVENT FROM BEING BLOWN AROUND THE AIRFIELD. TRASH IS CONSIDERED A HAZARD IN THAT IT MAY BECOME WINDBLOWN AND BECOME FOREIGN OBJECT DEBRIS (FOD); OR IT MAY ATTRACT UNWANTED WILDLIFE WHICH MAY PRESENT SERIOUS HAZARDS TO AIRCRAFT IN THE AOA. CONTRACTOR SHALL BE RESPONSIBLE FOR PICKING UP ALL OBSERVED FOD REGARDLESS OF THE SOURCE OF THE FOD.
- STANDING WATER
- THE CONTRACTOR WILL BE REQUIRED TO USE TEMPORARY PUMPS. AS NEEDED. TO PROVIDE DRAINAGE TO ANY EXCAVATION AREAS IN ORDER TO PROTECT EXPOSED BASE OR SUBGRADE MATERIALS FROM OVER-SATURATION AND WEAKENING. THE CONTRACTOR WILL BE REQUIRED TO SPRAY WORK AREAS FREQUENTLY THROUGHOUT THE PROJECT TO KEEP DOWN DUST AND WINDBLOWN IRRITANTS FROM THE WORK SITE ONTO THE AIRFIELD, OUT OF THE AOA, OR OFF AIRPORT-PROPERTY. WATER SPRAYED FOR DUST CONTROL MAY ACCUMULATE AND MUST BE MANAGED. THE CONTRACTOR MAY EMPLOY THE USE OF TEMPORARY DITCHES IN EXCAVATION AREAS TO ALLOW POSITIVE DRAINAGE AND MINIMIZE STANDING WATER STANDING WATER IS CONSIDERED A HAZARD IN THAT IT MAY ATTRACT LINWANTED WILDLIFE WHICH MAY PRESENT SERIOUS HAZARDS TO AIRCRAFT IN THE AGA
- TALL GRASS AND SEEDS
- THE AIRPORT IS REGULARLY MAINTAINED FOR VEGETATION (MOWING, WEED REMOVAL, ETC.). THESE MAINTENANCE ITEMS ARE REGULARLY SCHEDULED AND THE AIRPORT WILL CONTINUE THEM INDEFINITELY. PROJECT WILL DISTURB SOME AREAS USUALLY MOWED BY THE AIRPORT. CONTRACTOR SHALL MOW ALL AREAS IMMEDIATELY ADJACENT TO THE WORK ZONES AT A WIDTH OF 30 FEET FROM DISTURBED AREA. NO DIRECT PAYMENT SHALL BE MADE FOR THIS MOWING AND THIS WORK SHALL BE CONSIDERED SUBSIDIARY TO THE BID ITEM "MOBILIZATION".
- POORLY MAINTAINED FENCING AND GATES
- THE CONTRACTOR SHALL MAINTAIN, IN GOOD WORKING ORDER, ANY GATE HE USES FOR SITE ACCESS, ADDITIONALLY, THE CONTRACTOR WILL BE REQUIRED TO STRICTLY FOLLOW AIRPORT SECURITY PROTOCOLS FOR KEEPING THE AIRFIELD SECURE AT ALL TIMES AS WELL AS FOR ENTERING/EXITING THE AOA.
- DISRUPTION OF EXISTING WILDLIFE HABITAT.
- NO KNOWN HABITAT DISRUPTION SHOULD OCCUR AND NO KNOWN ISSUES ARE ANTICIPATED.

#### 7. FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT

- A MINIMUM OF ONE SWEEPER SHALL BE ON-SITE AND OPERATIONAL AT ALL TIMES. THE BROOM SHALL NOT BE COMPRISED OF STEEL BRISTLES. CONTRACTOR SHALL MAINTAIN EFFECTIVE CONTROL OF FOD AT ALL TIMES AND PRIOR TO OPENING TAXIWAYS AND RUNWAYS TO AIRCRAFT, CONTRACTOR SHALL HAVE A MECHANIZED BROOM DEDICATED FOR THE EXCLUSIVE USE OF CLEANING AND REMOVING FOD FROM THE RUNWAYS AND TAXIWAYS. THE ACCESS ROUTE ACROSS THE APRON SHALL BE SWEPT DAILY OR AS NEEDED TO PICK UP FOD, LOOSE DEBRIS, MUD, DIRT OR OTHER OBJECTS FROM THE ACCESS ROUTE THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMMEDIATELY CLEANING UP ANY FOD GENERATED FROM CONSTRUCTION ACTIVITIES. FROM ALL ACTIVE TAXIWAYS, AIRCRAFT MOVEMENT AREAS AND RUNWAY SAFETY AREAS.
- THE END OF THE WORK DAY, RUNWAY OBSTACLE FREE AREAS (400' FROM CENTERLINE OF RUNWAY) FOR ANY ACTIVE RUNWAY MUST BE CLEAR OF ALL PILES AND SURFACE IRREGULARITIES. ANY OPEN TRENCHES OR EXCAVATION ALONG AREAS OPEN TO AIRCRAFT SHALL BE BACKFILLED OR SECURELY COVERED AS SOON AS POSSIBLE AND NOT LEFT OPEN DURING NON-WORK HOURS. AIRCRAFT OPERATIONS WILL NOT BE ALLOWED ON A RUNWAY WHERE OPEN TRENCHES OR EXCAVATIONS OCCUR WITHIN THE ROFA.
- MATERIALS TRACKED ONTO THESE AREAS MUST BE REMOVED CONTINUALLY DURING THE COURSE OF THE PROJECT.

#### 8. HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT

 ALTHOUGH HAZARDOUS MATERIALS ARE NOT ANTICIPATED ON THIS PROJECT, THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A SAFETY AND HEALTH PLAN, WHICH DETAILS HOW THEIR COMPANY MANAGES AND HANDLES HAZARDOUS MATERIALS, FOR CIRCUMSTANCES WHICH MAY OCCUR ON THIS PROJECT. ALL LUBRICATING LIQUIDS AND SOLIDS (OILS AND GREASES) SHALL RE SECURED AND CONTAINED IN DRY AREAS LINTIL USED BY TRAINED PERSONNEL OR MECHANICS ALL WASTE MATERIAL SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE ENVIRONMENTAL LAWS AND ACCORDING TO MANUFACTURER'S DIRECTIONS, CONSTRUCTION FUEL SHALL NOT BE STORED AT THE SITE.

#### 9. NOTIFICATION OF CONSTRUCTION ACTIVITIES

 APPROPRIATE NOTICES TO AIRMEN (NOTAMS) MUST BE ISSUED PRIOR TO COMMENCING WORK ACTIVITIES IN THE VICINITY OF AIRCRAFT OPERATION AREAS. CONTRACTOR SHALL COORDINATE WORK ACTIVITIES AND PROJECT SCHEDULE WITH THE METROPOLITAN TOPEKA AIRPORT AUTHORITY (MTAA) AT LEAST TWO WEEKS PRIOR TO EACH CHANGE IN CONSTRUCTION PHASING. MTAA SHALL COORDINATE ISSUANCE OF NOTAMS BASED UPON INFORMATION SUPPLIED BY THE CONTRACTOR, MTAA SHALL ISSUE NOTAMS AND CONFIRM THAT NOTAMS HAVE BEEN PUBLISHED. PRIOR TO MOVING INTO AIRCRAFT MOVEMENT AREAS TO ERECT TRAFFIC CONTROL, CONFIRMATION OF ISSUANCE OF NOTAMS WITH AIR TRAFFIC CONTROL TOWER SHALL BE MADE WHILE SECURING PERMISSION TO ENTER AIRCRAFT MOVEMENT AREAS.

#### EMERGENCY NOTIFICATION PROCEDURES

IDENTIFICATION AND QUALIFICATIONS OF A DEDICATED SECURITY AND SAFETY POINT OF CONTACT. THE SUPERINTENDENT SHALL BE THE 24 HOUR ON-CALL REPRESENTATIVE.

#### FOR EMERGENCY SITUATIONS

24 HOUR EMERGENCY CONTACTS FOR POLICE. FIRE, MEDICAL RESPONSE, AND KEY PROJECT PERSONNEL - THE CONTRACTOR SHALL PRODUCE AN EMERGENCY CONTACT LIST WITHIN 7 DAYS FOLLOWING THE PRE-CONSTRUCTION MEETING. AT A MINIMUM, THE FOLLOWING EMERGENCY CONTACTS SHALL BE INCLUDED ON THE CONTACT LIST

CALL 911 FOR EMERGENCIES - FIRE / MEDICAL ASSISTANCE CALL 785-862-1130 FOR SECURITY RELATED ISSUES					
AGENCY	NAME	TITLE	PHONE		
METROPOLITAN TOPEKA AIRPORT AUTHORITY	SAFETY DEPARTMENT	EMERGENCY CALLS ONLY - POLICE & FIRE	(785) 862-1130	w	
METROPOLITAN TOPEKA AIRPORT AUTHORITY	ERIC M. JOHNSON	PRESIDENT & DIRECTOR OF AIRPORTS	(785) 862-2362	w	
METROPOLITAN TOPEKA AIRPORT AUTHORITY	BILL WEMPE	COLONEL SAFETY DEPARTMENT	(785) 862-9250	w	
METROPOLITAN TOPEKA AIRPORT			(785) 862-0711	w	
AUTHORITY	RITA EGGENBERGER	OPERATIONS OFFICER	(785) 640-5394	С	
METROPOLITAN TOPEKA AIRPORT AUTHORITY	TERRY POLEY	DEPUTY DIRECTOR OF MAINTENANCE	(785) 862-0711	w	
MIDWEST AIR TRAFFIC CONTROL SERVICES	JOHN WOOTEN	AIR TRAFFIC CONTROL TOWER MANAGER	(785) 862-2058	w	
	SAM STALLBAUMER, PE	PROJECT MANAGER	(816) 702-4244	w	
WOF USA INC			(210) 867-6532	С	

10. INSPECTION REQUIREMENTS

DAILY INSPECTIONS

THE CONTRACTOR IS RESPONSIBLE FOR QUALITY CONTROL INSPECTION OF HIS/HER OWN WORK AS WELL AS FOR ALL SAFETY REQUIREMENTS FOR THE PROJECT. THE CONTRACTOR IS REQUIRED TO ADHERE TO THE CONTRACT DOCUMENTS, WHICH INCLUDE ALL SAFETY REQUIREMENTS OF THIS SAFETY AND PHASING PLAN. INSPECTIONS OF THE WORK ZONE CONES/BARRICADES, STOCKPILE AREAS, EQUIPMENT, EROSION/SEDIMENT CONTROL DEVICES AND ADJACENT SURFACES SHALL OCCUR ON A DAILY BASIS TO ENSURE ALL CONDITIONS MEET THE REQUIREMENTS SPECIFIED WITHIN THIS SAFETY & PHASING PLAN AND THE CONTRACT DOCUMENTS. THE CONTRACTOR WILL ALSO BE RESPONSIBLE FOR ANY INSPECTIONS OF MOVEMENT AREAS PRIOR TO THE AREA BEING OPENED FOR ANY AIRCRAFT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADDRESS CONSTRUCTION SAFETY ISSUES ADJACENT OR INCIDENTAL TO THE PROJECT, EVEN IF THEY ARE NOT DIRECTLY RELATED TO THIS PROJECT.

#### FINAL INSPECTIONS

WORK AREAS SHALL BE INSPECTED BY CONTRACTOR/RESIDENT PROJECT REPRESENTATIVE (RPR)/MTAA PRIOR TO ANY PAVEMENT SECTION BEING RE-OPENED TO AIRCRAFT THE CONTRACTOR SHALL PERFORM A FINAL INSPECTION OF ALL HAUL ROUTES NEAR THE COMPLETION OF PHASE 2 WITH ANY DEFECTS BEING REPAIRED AS BEING A CONDITION FOR SUBSTANTIAL COMPLETION FOR THE PROJECT.

PILES OF RUBBLE AND/OR SUPPLIES ARE NOT PERMITTED ALONG ANY AREAS OPEN TO AIRCRAFT. ANY PILE GENERATED IN THESE AREAS SHALL BE CLEANED UP AND HAULED AWAY BEFORE

THE CONTRACTOR SHALL CONTROL DUST AND DEBRIS THAT RESULTS FROM THEIR OPERATIONS. WASTE AND LOOSE MATERIALS SHALL NOT BE PLACED IN ACTIVE MOVEMENT AREAS.

ANY DAMAGE ALONG THE HAUL ROUTES SHALL BE REPAIRED BY THE CONTRACTOR PRIOR TO THE COMPLETION OF THE PHASE FOR WHICH THE ROUTE IS USED. ALL HAUL ROUTES AND


# 11. UNDERGROUND UTILITIES

- PROCEDURE FOR LOCATING AND PROTECTING EXISTING UNDERGROUND UTILITIES, CABLES, AND WIRES:
- PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL WALK THE JOB SITE WITH THE OWNER, AIRPORT OPERATIONS AND FAA TECHNICAL SERVICES TO IDENTIFY ANY EXISTING •• UNDERGROUND UTILITIES, CABLES, AND WIRES.
- THE CONTRACTOR SHALL VERIFY, IDENTIFY, LOCATE, MARK OUT, AND PROTECT THE ACTUAL LOCATIONS OF UTILITIES PRIOR TO ANY EXCAVATION. WHEN AT ALL FEASIBLE, THE •• CONTRACTOR WILL MARK EXISTING UTILITIES IN THE MOVEMENT AREA.
- THE CONTRACTOR SHALL COORDINATE WITH ALL APPROPRIATE AGENCIES.
- THE CONTRACTOR SHALL HAND-DIG WHEN WITHIN 3 FEET OF ANY KNOWN OR SUSPECTED UTILITY.
- THE CONTRACTOR SHALL PROTECT ALL UNDERGROUND UTILITIES DURING THE DURATION OF THE PROJECT. ••

### 12. PENALTIES

- IN THE EVENT AN EMPLOYEE OF THE CONTRACTOR VIOLATES A SAFETY PROVISION. THEY SHALL BE PROHIBITED FROM RETURNING TO WORK ON THE AGA WITHOUT REMEDIAL SAFETY TRAINING AND THE APPROVAL OF THE AIRPORT, VIOLATIONS MAY BE DEFINED AS JUST AND SUFFICIENT CAUSE TO REQUIRE THE EMPLOYEE BE PERMANENTLY REMOVED FROM THE JOB SITE AT THE DISCRETION OF THE AIRPORT. SHOULD VIOLATIONS BY CONTRACTOR PERSONNEL BE SUBJECT TO FINES AS ASSESSED BY THE FEDERAL AVIATION ADMINISTRATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PAYMENT OF SAID FINES AND THE REMOVAL OF THE EMPLOYEE RESPONSIBLE FOR THE VIOLATION TO BE REMOVED FROM THE PROJECT SITE PERMANENTLY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS AND DELAYS CAUSED BY A SAFETY VIOLATION(S). CONSTRUCTION PERSONNEL DRIVING ERRATICALLY ON THE AIRPORT, EXCEEDING THE 20 MPH SPEED LIMIT, OR VIOLATING ANY OTHER AIRPORT DRIVING RULE OR SAFETY REGULATION, AT A MINIMUM, SHALL BE REMOVED FROM THE PROJECT PERMANENTLY. AIRPORT OPERATIONS CAN REMOVE ANY CONTRACTOR PERSONNEL, AT ANY TIME, FOR ANY DURATION, DUE TO A SAFETY VIOLATION. AIRPORT OPERATIONS SHALL REPORT ANY OCCURRENCES TO THE CONTRACTOR AND THE OWNER.

#### 13. SPECIAL CONDITIONS

- ALL CONTRACTOR'S SUPERVISORY PERSONNEL (PROJECT MANAGERS, SUPERINTENDENTS, FOREMEN, AND LEAD WORKERS) WHO WILL BE DIRECTING THE PROJECT WORK, WHO WILL BE DRIVING EQUIPMENT ON THE AIRFIELD, OR ESCORTING OTHERS ON THE AIRFIELD SHALL BE REQUIRED TO TAKE AND PASS THE MTAA PEDESTRIAN/FLIGHT LINE DRIVING COURSE OF INSTRUCTION TRUCK DRIVERS AND FOUIPMENT OPERATORS WHO WILL BE DRIVING STRICTLY WITHIN THE CONFINES OF THE HAUL ROUTES AND THE PROJECT AREA WILL NOT BE REQUIRED TO TAKE THIS TRAINING COURSE. THOSE DRIVERS OR OPERATORS WHO WILL BE DRIVING OUTSIDE OF THE HAUL ROUTES OR PROJECT LIMITS WILL BE REQUIRED TO TAKE AND PASS THE TRAINING COURSE, THIS COURSE OF INSTRUCTION LASTS APPROXIMATELY 1-2 HOURS AND WILL BE PROVIDED BY THE MTAA TO CONTRACTOR'S PERSONNEL AT NO COST TO THE CONTRACTOR. CONTRACTOR WILL ATTEMPT TO PROVIDE PERSONNEL FOR TRAINING IN GROUPS SO AS TO MINIMIZE THE NUMBER OF TRAINING SESSIONS. TRAINING SESSIONS SHALL BE COORDINATED WITH RITA EGGENBERGER, OPERATIONS OFFICER, 785-862-0399.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ESCORT VEHICLES/PERSONNEL TO PROVIDE ESCORT FOR ASPHALT DELIVERY TRUCKS. CONCRETE READY-MIX TRUCKS OR OTHER VEHICLES THAT WILL DELIVER FRESH MATERIALS TO OR REMOVE MATERIALS FROM THE WORK SITE WITHIN THE AOA OR HAULING AWAY MATERIALS FROM THE AOA TO BE DISPOSED AT OFFSITE LOCATIONS MTAA SAFETY PERSONNEL SHALL PROVIDE TRAINING FOR CONTRACTOR'S PERSONNEL AT THE ONSET OF THE PROJECT TO PROVIDE ESCORT AND AIRFIELD MOVEMENT TRAINING

#### 14. RUNWAYS AND TAXIWAY VISUAL AIDS

GENERAL

CLOSURES SHALL BE NOTED WITH THE USE OF LOW PROFILE BARRICADES AT RUNWAY AND TAXIWAY CROSSINGS. BARRICADES SHALL BE SECURED TO PREVENT MOVEMENT FROM JET BLAST, THE AIRPORT WILL PROVIDE NOTAMS FOR CLOSURES AND THE CONTRACTOR WILL BE REQUIRED TO PROVIDE. PLACE AND MAINTAIN TEMPORARY BARRICADES AT CLEARLY VISIBLE LOCATIONS TO KEEP PILOTS FROM ERRANTLY TAXING DOWN A CLOSED TAXIWAY OR CLOSED RUNWAY. LOW PROFILE BARRICADES ARE TO BE PLACED AT THE RSA BOUNDARY

#### MARKINGS

ALL PAVEMENT MARKINGS SHALL BE REPLACED FOR RUNWAY AND TAXIWAY RELATED RECONSTRUCTION OR REHABILITATION WORK, PAVEMENT MARKINGS WILL COMPLY WITH CURRENT FAA ADVISORY CIRCULAR 150/5340-1M "STANDARDS FOR AIRPORT MARKINGS". EXISTING STRIPING THAT IS IN CONFLICT WITH TEMPORARY PHASES WILL BE REMOVED BY WATER BLASTING OR OTHERWISE APPROVED METHODS, TEMPORARY STRIPING WILL BE PLACED IN ONE APPLICATION AND SHALL NOT INCLUDE BEADS, TEMPORARY STRIPING THAT WILL STAY IN PLACE FOR MORE THAN SIXTY DAYS WILL BE INSTALLED AS PERMANENT MARKING, PLACED IN ONE APPLICATION AND SHALL INCLUDE BEADS. ALL MARKINGS SHALL CONFORM TO SPECIFICATION P-620.

#### LIGHTING AND VISUAL NAVAIDS

- •• THE RUNWAY LIGHTS SHALL BE DEACTIVATED OR COVERED WHEN THE RESPECTIVE RUNWAY OR ANY PORTION OF A RUNWAY IS CLOSED.
- •• IF CLOSURES ARE REQUIRED, CLOSED TAXIWAY EDGE LIGHTS AND GUIDANCE SIGNAGE SHALL BE COVERED TO FURTHER ELIMINATE THE POSSIBILITY OF CONFUSING A PILOT. LIGHTING ACTIVITIES SHALL COMPLY WITH CURRENT FAA ADVISORY CIRCULAR 150/5340-30J "DESIGN AND INSTALLATION DETAILS FOR AIRPORT VISUAL AIDS". AC 150/5345-50B "SPECIFICATION FOR PORTABLE RUNWAY AND TAXIWAY LIGHTS" AND AC 150/5345-53D "AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM".

#### SIGNS

- GUIDANCE SIGNAGE SHALL BE COVERED TO FURTHER ELIMINATE THE POSSIBILITY OF CONFUSING A PILOT. SIGNS MUST BE IN CONFORMANCE WITH CURRENT FAA ADVISORY CIRCULAR •• 150/5345-44K "SPECIFICATION FOR RUNWAY AND TAXIWAY SIGNS", AC 150/5340-18G "STANDARDS FOR AIRPORT SIGN SYSTEMS" AND AC 150/5345-53D "AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM".
- ALL OUTBOUND DESTINATIONS SIGNS FOR THE CLOSED RUNWAY NEED TO BE COVERED. ••
- ALL RUNWAY EXIT SIGNS LEADING TO A CLOSED TAXIWAY NEED TO BE COVERED ..
- •• DO NOT COVER TAXIWAY DIRECTIONAL SIGNS THAT LEAD TO CLOSED TAXIWAYS.

#### 15. MARKING AND SIGNS FOR ACCESS ROUTES

THE ACCESS ROADS USED FOR HAULING AND DELIVERY OF MATERIALS TO THE SITE SHALL BE MARKED WITH TEMPORARY GUIDANCE SIGNS (STAKE MOUNTED OR SAW-HORSE, WEIGHTED DOWN WITH SAND BAGS) CONFORMING TO CURRENT FAA ADVISORY CIRCULAR 150/5345-44K, AC 150/5340-18G, MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) OR STATE HIGHWAY DEPARTMENT REQUIREMENTS. AT ALL ENTRANCES TO THE AOA, SPEED LIMIT SIGNS (20 MPH) SHALL BE PLACED. STOP SIGNS AND DIRECTION ARROW SIGNS SHALL BE PLACED AT KEY POINTS ALONG THE ACCESS ROAD TO ENSURE THE CONTRACTOR VEHICLES DRIVING THE ROUTE ADHERE TO YIELDING ALL AIRCRAFT THE RIGHT-OF-WAY AT ALL TIMES AND MINIMIZING POTENTIAL FOR ACCIDENTS OR ERRANTLY DRIVING OFF THE ROUTE.

### 16. HAZARD MARKING AND LIGHTING

- CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRAFFIC CONTROL USED DURING THE COURSE OF THE PROJECT. CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN AND DISMANTLE ALL TRAFFIC CONTROL ITEMS USED DURING COURSE OF THE PROJECT. BARRICADES AROUND AIRCRAFT MOVEMENT AREAS MUST BE LOW PROFILE. LOW MASS BARRICADES SIMILAR TO THAT SHOWN ON SHEET C113.
- ALL VEHICLES AND EQUIPMENT THAT WILL BE CROSSING OR OPERATING IN THE AIR OPERATIONS AREAS OR ON ANY ACTIVE RUNWAY OR TAXIWAY, AIRCRAFT MOVEMENT AREAS AND RUNWAY SAFETY AREAS SHALL BE MARKED WITH EITHER A FLAG OR A FLASHING BEACON. THE FLAGS (DAYTIME USE) SHALL BE ON A STAFF ATTACHED TO THE VEHICLE, 3-FOOT SQUARE WITH ORANGE AND WHITE CHECKERED PATTERN. BEACONS SHALL BE OF ADEQUATE SIZE AND STRENGTH AS TO BE VISIBLE FROM THE AIR AND MOUNTED ON THE UPPERMOST PART OF THE VEHICLE. ALL VEHICLES OPERATING DURING NIGHTTIME OPERATIONS SHALL BE EQUIPPED WITH A FLASHING AMBER BEACON.

## 17. PROTECTION

NO WORK SHALL OCCUR WITHIN A ROFA OR A TOFA OF AN OPEN RUNWAY OR TAXIWAY.

- CONTRACTOR SHALL CONFINE THEIR WORK ACTIVITIES ALONG TAXIWAY ALPHA, THE EXISTING FUEL FARM AREA, AN AREA OR WORK ZONE SUCH THAT TRENCHES, OPEN EXCAVATIONS, AND CLEANING OPERATIONS CAN BE PER DAY
- ALL CONTRACTOR'S AND SUBCONTRACTORS' VEHICLES, PERSONNEL AND EQUIPMENT SHALL BE CONFINED TO THE LIMITS OF THE CONSTRUCTION PHASES, OCCUPYING ONLY THE PHASE WHERE WORK IS IN PROGRESS.

#### 18. OTHER LIMITATIONS ON CONSTRUCTION

- WORK WILL NOT BE PERMITTED WITHIN THE RUNWAY SAFETY AREA FOR RUNWAY 13-31 OR RUNWAY 18-36 WHILE THE RESPECTIVE RUNWAY IS OPEN TO AIRCRAFT TRAFFIC.
- FLARE POTS AND BLASTING ARE PROHIBITED FROM USE ON THIS PROJECT.
- OPEN FLAME WELDING, WITH ADEQUATE FIRE SAFETY PRECAUTIONS, WILL BE ALLOWED.

ND THE NEW FUEL FARM AREA. ADDITIONALLY, ACTIVITIES SHOULD BE CONFINED TO
ORMED IN A RELATIVELY SHORT PERIOD OF TIME PRIOR TO THE END OF THE WORK





# **TEMPORARY STOP SIGN DETAILS**

SIDE VIEW - NOT TO SCALE

# NOTES:

- 1. TEMPORARY STOP SIGN SHALL BE RED RETROREFLECTIVE BACKGROUND WITH WHITE RETROREFLECTIVE LETTERS.
- 2. TEMPORARY STOP SIGNS SHALL CONFORM TO MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) STANDARD HIGHWAY SIGNS 2009.
- 3. ALL TEMPORARY TRAFFIC SIGNS SHALL BE CHECKED THROUGHOUT THE DAY TO ENSURE CORRECT WORKING ORDER AND A FINAL CHECK SHALL TAKE PLACE BY THE CONTRACTOR PRIOR TO LEAVING THE SITE EACH DAY.
- 4. TEMPORARY STOP SIGN INSTALLATION SHALL CONFORM TO MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) STANDARD HIGHWAY SIGNS 2009, CHAPTER 6F: TEMPORARY TRAFFIC CONTROL ZONE DEVICES. SIGN MOUNTING METHOD SHALL BE NON-DESTRUCTIVE TO EXISTING PAVEMENT. FINAL SIGN SHALL BE APPROVED BY RESIDENT PROJECT REPRESENTATIVE (RPR) AND AIRPORT OPERATIONS PRIOR TO INSTALLATION.
- 5. SIGNS SHALL BE MOUNTED ON FRANGIBLE BASES.
- TEMPORARY STOP SIGNS LABELED TS-1.1 SHALL BE LOCATED WITHIN THE PHASE LIMITS AS SUCH 6. TO PREVENT TRAFFIC FROM TRAVELING ONTO ACTIVE AIRPORT PAVEMENT. DURING SUB-PHASES IN WHICH TAXIWAY ALPHA IS SHUTDOWN, THESE SIGNS CAN BE TEMPORARILY COVERED OR REMOVED.
- 7. STOP SIGNS TO BE LOCATED OUTSIDE OF TAXIWAY OBJECT FREE AREA (TOFA).



SIDE VIEW - NOT TO SCALE



# LOW-PROFILE BARRICADE DETAIL TOP VIEW - NOT TO SCALE

# PVC PIPE 24" 6"

# **CLOSED TAXIWAY LIGHT COVER** SIDE VIEW - NOT TO SCALE

# NOTES:

1. COVER SHALL BE BLACK, SCHEDULE 40 PVC PIPE



# **CLOSED TAXIWAY MARKER**

COLOR - YELLOW

## NOTES:

- 1. MARKER SHALL BE PLACED AS SHOWN ON THE TRAFFIC CONTROL PLAN
- FENCE IS NOT CONSIDERED ACCEPTABLE MATERIAL



## NOTES:

- 1. FLARES TO BE FLASHING AND BATTERY OPERATED. LENS TO BE RED AND ABLE TO ROTATE 90 DEGREES (AMBER LENS WILL NOT BE ACCEPTABLE).
- 2. ALTERNATING FLARE LENS ARE ROTATED 90 DEGREES TO ADJACENT LENS.
- 3. SUPPORT BRACES TO BE SECURELY ATTACHED TO 2" X 8".
- 4. SAND BAGS OR OTHER ADEQUATE WEIGHT TO BE PLACED ON EACH SUPPORT BRACE.
- 5. FACING OF 2" X 8" TO BE COVERED WITH REFLECTIVE TAPE OR PAINT.
- 6. NO SEPARATED PAYMENT WILL BE MADE FOR THIS ITEM.
- 7. PLACE AT 12' CENTER TO CENTER INTERVALS (4' GAP).
- 8. BARRICADES SHALL BE LOCATED IN A LINE PARALLEL WITH THE RUNWAY OR THE TAXIWAY CENTERLINE.

NOT TO SCALE

2. MARKINGS SHALL BE FLEXIBLE MATERIAL SUCH AS POLYMER FABRIC OR FINE MESH. SNOW



	No. Date By Issue			
	CONSTRUCTION SAFETY & PHASING PLAN DETAILS			
	METROPOLITAN TOPEKA AIRPORT AUTHORITY FOE FUEL FARM AIP NO. 3-20-0113-045 TOPEKA REGIONAL AIRPORT			
FOR BID	300 WXANDOTTF	V SUITE 200	TEL: +1 816.702.4300 MEROPOUTANTOPEKA ARPORT AUTHORITY	TOPEKA RECIONAL BILLARD ARPORT APPORT & SLINESS CENTR
ISSUED	Sheet	Engineer: SFS	C Uesigner: LAM C	G Date: 13JAN2023







# wsp

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