



# Longview Multimodal Transportation Center Longview, Texas

August 2015

PROPOSAL FORMS, CONTRACT DOCUMENTS,  
TECHNICAL SPECIFICATIONS, AND  
GEOTECHNICAL REPORT

Prepared By:



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## **ADVERTISEMENT FOR BIDS**

Sealed proposals addressed to Rolin McPhee, P.E., Director of Public Works, City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604, will be received until **2:00 p.m., Thursday, September 10, 2015**, for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of the **Longview Multimodal Transportation Center**, in accordance with the specifications on file at Johnson & Pace Incorporated. At the time stated, bids will be opened and publicly read in the Public Works Training Room of the Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604.

Beginning on **Monday, August 24, 2015**, plans and specifications may be examined without charge or obtained for a purchase price of **\$75.00** per set at the office of Johnson & Pace Incorporated, 1201 NW Loop 281, Suite 100, Longview, Texas, 75604.

A pre-bid meeting for all prospective bidders will be held at **2:00 p.m., Tuesday, September 1, 2015**, in the Public Works Training Room of the Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604.

**EEO/M/F/V/H/D.**

**ROLIN McPHEE, P.E.  
DIRECTOR OF PUBLIC WORKS  
CITY OF LONGVIEW, TEXAS**

**NOTICE TO BIDDERS OF THE INTENTION OF THE CITY OF LONGVIEW, TEXAS TO LET BIDS FOR THE CONSTRUCTION OF LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

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**SEALED PROPOSALS** addressed to Rolin McPhee, P.E., Director of Public Works, City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604, will be received until **2:00 P.M., THURSDAY, SEPTEMBER 10, 2015**, for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of **Longview Multimodal Transportation Center**, in accordance with the plans and specifications on file at Johnson & Pace Incorporated. At the time stated, bids will be opened and publicly read at the City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604.

**PLANS AND SPECIFICATIONS** may be examined without charge or obtained for a purchase price of **\$75.00** per set at the office of Johnson & Pace Incorporated, 1201 NW Loop 281, Suite 100, Longview, Texas, 75604. Refunds will be made for undamaged sets returned by actual project bidders at the bid opening, after which time no refunds will be made.

**ALL BID PROPOSALS** submitted should be marked clearly on the outside of the sealed envelope with the project name and bid opening time and date.

**PRE BID MEETING** will be held on **TUESDAY, SEPTEMBER 1, 2015, AT 2:00 P.M.**, in the Public Works Training Room at the Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604..

**A CERTIFIED OR CASHIER'S CHECK**, or an acceptable bid bond in an amount not less than five percent (5%) of the base bid shall accompany each bid as a guaranty that, if awarded the contract, the bidder will promptly enter into contract with the City of Longview, Texas and furnish bonds on the forms provided.

**THE SUCCESSFUL BIDDER OR BIDDERS** will be required to furnish a Performance Bond, Payment Bond, and Maintenance Bond, in the amount of the contract, written by a responsible surety company authorized to do business in the State of Texas, and satisfactory to the Owner as required by Article 5160 V.A.T.C.S.

**BIDDERS ARE EXPECTED TO INSPECT** the site of the work and to inform themselves of all local conditions. Time of completion shall be **365** calendar days, including Saturdays, Sundays, and legal holidays.

**NO BID** may be withdrawn after the scheduled closing time for receipt of bids for at least 90 calendar days.

**IN CASE** of ambiguity or lack of clearness stating the price in the bids, the Owner reserves the right to consider the most advantageous construction thereof or to reject the bid. The Owner reserves the right to reject any or all bids, waive any or all informalities, and to award the contract to the bidder or

bidders who, in the opinion of the Owner, offers the proposal to the best interest of same.

**EEO/M/F/V/H/D**

**ROLIN McPHEE, P. E.  
DIRECTOR OF PUBLIC WORKS  
CITY OF LONGVIEW, TEXAS**

## **INFORMATION FOR BIDDERS**

1. **Receipt and Opening of Proposals.** The City of Longview (Owner) invites Proposals to be submitted on the forms provided. Proposals will be received by the Owner at the Public Works Service Center, 933 Mobile Drive, Longview, TX, 75604, until the time and date specified in the Notice to Bidders, and then at the stated time and place publicly opened and read aloud. Only the total amount of the bid will be read aloud, however, the Proposals will be open for public inspection immediately following the opening.

The Owner reserves the right to waive any informality and to reject any or all bids. Any Proposal received after the specified time will be returned to the Bidder unopened. No Proposal may be withdrawn within 90 days from the opening date. Conditional bids will not be considered.

2. **Preparation of Proposals.** Each Proposal must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the Proposal is submitted. If forwarded by mail, the sealed envelope containing the Proposal must be enclosed in another envelope addressed as specified.
3. **Withdrawal or Modification of Bid.** Prior to the bid opening, no Proposal may be withdrawn after 48 hours before the time of the bid opening. Any modification of any bid may be made under the same conditions as set forth for submitting a Proposal.
4. **Qualifications of Bidders.** The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that the bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.
5. **Bid Security.** Each Proposal must be accompanied by cash, certified check of the Bidder, or a bid bond duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the base bid. Such cash, checks or bid bonds will be returned to all except the three lowest Bidders within three days after the opening of bids, and the remaining cash, checks, or bid bonds will be returned promptly after the Owner and the accepted Bidder have executed the contract, or if no award has been made within 90 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his Proposal.
6. **Liquidated Damages for Failure to Enter into Contract.** The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 15 days after he has received notice of the acceptance of his Proposal, shall forfeit to the Owner, as

liquidated damages for such failure or refusal, the security deposited with his Proposal.

7. **Time of Completion and Liquidated Damages.** Bidder must agree to commence work within 10 days after the date to be specified in a written "Notice to Proceed" by the Owner and to fully complete the project within the time stated in the Proposal. The bidder must agree to pay, as liquidated damages, the sum of \$470.00 for each consecutive calendar day thereafter as hereinafter provided for in the General Conditions.
8. **Conditions of Work.** Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provision of his Contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.
9. **Addenda and Interpretation.** No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any Bidder orally. Every request for such interpretation should be in writing addressed to **Johnson & Pace Incorporated, 1201 NW Loop 281, Suite 100, Longview, TX 75604**, and to be given consideration must be received at least five days prior to the date fixed for the opening of Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by regular mail to all prospective bidders not later than two days prior to the date fixed for the opening of Proposals. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his bid as submitted. Each Bidder shall check with **Johnson & Pace Incorporated** at an appropriate time to determine that he or she has received all Addenda; failure to do so shall be the complete responsibility of the Bidder. All addenda so issued shall become part of the contract documents.
10. **Security for Faithful Performance.** Simultaneously with his delivery of the executed Contract, the Contractor shall furnish bonds as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under Contract and furnishing materials in connection with Contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner. In the case that the total bid is \$25,000. or less, the Contractor may elect not to furnish a Performance and Payment Bond; provided that it is understood and agreed that no progress or monthly payment will be made and that final payment will be made following completion and acceptance by the City of the entire project.
11. **Power of Attorney.** Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
12. **Laws and Regulations.** The bidder's attention is directed to the fact that all applicable State

laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout and they will be deemed to be included in the Contract the same as though herein written out in full.

13. **Obligation of Bidder.** At the time of the opening of Proposals each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents, including all addenda. The failure or omission of any Bidder to examine any form, instrument or document shall in no way relieve any Bidder from any obligation in respect of his bid.
14. **Certification of Completion.** A Certificate of Completion, which is included in these contract documents, will be required in the final completion and acceptance of the project as provided in the General Conditions of Agreement Item 5.06.

# Liquidated Damages Calculation

PROJECT LONGVIEW MULTIMODAL TRANSPORTATION CENTER  
 C.I.P. PROJECT NO. \_\_\_\_\_ PROJECT MANAGER Alton Bradley, P.E.  
 CONTRACT NO. \_\_\_\_\_ PROJECT SPONSOR \_\_\_\_\_  
 PREPARED BY Johnson & Pace Incorporated DATE August 19, 2015

## **ON-SITE PROJECT INSPECTION (CITY FORCES)**

Engineer/Architect.....	<u>4</u> hr/wk @	<u>\$43.65</u> /hr =	<u>\$174.60</u> /wk (÷7) =	<u>\$24.94</u> /day
Supervising Inspector.....	<u>32</u> hr/wk @	<u>\$22.24</u> /hr =	<u>\$711.68</u> /wk (÷7) =	<u>\$101.67</u> /day
Inspector.....	<u>0</u> hr/wk @	<u>\$0.00</u> /hr =	<u>\$0.00</u> /wk (÷7) =	<u>\$0.00</u> /day
				Sub-Total = <u>\$126.61</u> /day
Overhead: <u>.00</u> % of Sub-Total.....				= <u>\$126.61</u> /day

## **Overtime (over 40 Hours):**

Supervising Inspector.....	<u>0</u> hr/wk @	<u>\$0.00</u> /hr =	<u>\$0.00</u> /wk (÷7) =	<u>\$0.00</u> /day
Inspector.....	<u>0</u> hr/wk @	<u>\$0.00</u> /hr =	<u>\$0.00</u> /wk (÷7) =	<u>\$0.00</u> /day
				Sub-Total = <u>\$0.00</u> /day
Overhead: <u>.00</u> % of Sub-Total.....				= <u>\$0.00</u> /day

## **Consulting Services:**

Engineer/Architect (Private Sector).....	<u>8</u> hr/wk @	<u>\$150.00</u> /hr =	<u>\$1,200.00</u> /wk (÷7) =	<u>\$171.43</u> /day
Technician (Private Sector).....	<u>8</u> hr/wk @	<u>\$105.00</u> /hr =	<u>\$840.00</u> /wk (÷7) =	<u>\$120.00</u> /day

## **Project Management**

Project Manager (City).....	<u>4</u> hr/wk @	<u>\$43.65</u> /hr =	<u>\$174.60</u> /wk (÷7) =	<u>\$24.94</u> /day
Technician (City).....	<u>2</u> hr/wk @	<u>\$24.33</u> /hr =	<u>\$48.66</u> /wk (÷7) =	<u>\$6.95</u> /day
				Sub-Total = <u>\$31.89</u> /day
Overhead: <u>.00</u> % of Sub-Total.....				= <u>\$31.89</u> /day

## **INTEREST ON MONEY PAID TO THE CONTRACTOR, BUT NOT USABLE**

Assuming 80% paid @ completion date:

Construction Cost.....	<u>\$186,000.00</u>
Total Paid (80%).....	<u>\$148,800.00</u>
Daily Interest @ 0.0110 % of Total Paid: (or 4 % annual interest rate):.....	= <u>\$16.37</u> /day
Loss of Revenue for Revenue Producing Projects.....	= <u>\$0.00</u> /day
Loss of Capital Recovery Fees.....	= <u>\$0.00</u> /day
Actual Expenses Incurred.....	= <u>\$0.00</u> /day
Equipment Rental.....	= <u>\$0.00</u> /day
Space Rental.....	= <u>\$0.00</u> /day
Total per Calendar Day <u>\$466.30</u>	
<b>USE</b>	<b><u>\$470.00</u></b>

**CITY OF LONGVIEW  
PUBLIC WORKS DEPARTMENT**

CERTIFICATE OF FINAL COMPLETION OF: LONGVIEW MULTIMODAL TRANSPORTATION CENTER

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CONTRACT DATED: \_\_\_\_\_

STATE OF TEXAS  
COUNTY OF GREGG }

Before me, the undersigned authority, a Notary Public in and for Gregg County, Texas, on this day personally appeared \_\_\_\_\_ who, being by me duly sworn on his oath, says that he is/represents \_\_\_\_\_, the contractor who has performed a contract with the City of Longview for the construction of the work described above, and is duly authorized to make this affidavit; that he has personally examined the work described above as required by the specifications of the City of Longview attached to the contract; that said work and all items thereof have been completed and all known defects made good; that thereof have been completed and all known defects made good; that all surplus material, refuse, dirt and rubbish have been cleaned up, removed and disposed of; that all parts of the work are in a neat, tidy, finished condition and ready in all respects for acceptance by the City; that all the required work has been performed in accordance with the specifications, that rates of pay for all labor employed on said work have not been below the minimum set out in Labor Classification and Minimum Wage Scale in said Specifications and that within the knowledge of affiant all just bills for labor and material and for the rental or use of any equipment or apparatus used in, on, or in connection with the work have been paid in full by the Contractor.

\_\_\_\_\_

Sworn to and subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public, Gregg County, Texas

This is to certify that I have thoroughly inspected the work performed by the above named contractor on the above described contract and find all things in accordance with the plans and specifications governing this work.

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Inspector

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Project Consulting Engineer

General Decision Number: TX150011 01/02/2015 TX11

Superseded General Decision Number: TX20140011

State: Texas

Construction Types: Heavy and Highway

Counties: Bowie, Gregg, Rusk, Smith and Upshur Counties in Texas.

HEAVY & HIGHWAY CONSTRUCTION PROJECTS

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number Publication Date 0 01/02/2015

\* SUTX2011-004 08/02/2011

Rates Fringes

CEMENT MASON/CONCRETE FINISHER (Paving and Structures).....\$ 13.16

ELECTRICIAN.....\$ 19.87

FORM BUILDER/FORM SETTER Paving & Curb.....\$ 13.93 Structures.....\$ 13.38

LABORER Asphalt Raker.....\$ 12.02 Flagger.....\$ 8.50 Laborer, Common.....\$ 10.08  
Laborer, Utility.....\$ 12.70 Pipelayer.....\$ 14.64 Work Zone Barricade  
Servicer.....\$ 11.46

POWER EQUIPMENT OPERATOR: Asphalt Distributor.....\$ 13.88 Asphalt Paving Machine.....\$ 12.35  
Broom or Sweeper.....\$ 10.08 Crane, Lattice Boom 80 tons or less.....\$ 13.85  
Crawler Tractor.....\$ 13.62  
Excavator 50,000 pounds or  
less.....\$ 13.67  
Excavator Operator over  
50,000 pounds.....\$ 13.52  
Foundation Drill, Truck  
Mounted.....\$ 22.05  
Front End Loader , over 3  
cy.....\$ 12.33  
Front End Loader, 3 cy or  
less.....\$ 13.40  
Loader/Backhoe.....\$ 12.97  
Mechanic.....\$ 17.47  
Milling Machine.....\$ 12.22  
Motor Grader, Fine Grade....\$ 16.88

Motor Grader, Rough.....\$ 15.83  
Pavement Marking Machine....\$ 13.10  
Roller, Asphalt.....\$ 11.96  
Roller, Other.....\$ 10.44  
Scraper.....\$ 10.85  
Spreader Box.....\$ 13.12

Servicer.....\$ 14.11

Steel Worker (Reinforcing).....\$ 17.53

TRUCK DRIVER Lowboy-Float.....\$ 13.41 Off-Road  
Hauler.....\$ 10.08 Single Axle.....\$ 10.75 Single or  
Tandem Axle Dump..\$ 11.95 Tandem Axle Tractor w/Semi  
Trailer.....\$ 12.50

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

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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 Regional Office for the area in which the survey was conducted because those Regional Offices have 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.

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END OF GENERAL DECISION

**PROPOSAL**

**CITY OF LONGVIEW  
PUBLIC WORKS SERVICE CENTER  
933 MOBILE DRIVE  
LONGVIEW, TX 75604  
LONGVIEW MULTIMODAL TRANSPORTATION CENTER  
2:00 P.M., THURSDAY, SEPTEMBER 10, 2015**

Proposal of \_\_\_\_\_, (hereinafter called "Bidder"), a corporation, organized and existing under the laws of the State of \_\_\_\_\_ a partnership, or an individual doing business as \_\_\_\_\_ (strike out inapplicable terms).

TO THE CITY OF LONGVIEW, TEXAS (OWNER):

The undersigned bidder, in response to the Notice to Bidders for the construction of the above project and in conformance with the Information for Bidders; having examined the plans, specifications, related documents and the site of the proposed work; being familiar with all of the conditions relating to the construction of the proposed project, including the availability of materials and labor; hereby proposes to furnish all labor, materials, supplies, equipment, and superintendence necessary for the construction of the project in accordance with the plans, specifications, and contract documents at the unit prices proposed herein.

The undersigned Bidder proposes, acknowledges, and agrees to construct the entire project as shown on the plans, fully in accordance with the requirements of the plans, specifications, and contract documents for the prices included in this Proposal and fully understands and agrees that the various items of material, labor, and construction not specifically enumerated and provided for herein are considered subsidiary to the several items for which this direct payment is specifically provided. Furthermore, the undersigned agrees that one such subsidiary item is the protection, maintenance, repair, or replacement of all underground lines and services, whether shown on the plans or not, all to the full satisfaction of the Engineer and in a timely manner.

**SCHEDULE OF RATES AND PRICES**  
**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

Full compensation for compliance with Each and every provision of the Proposal and Bid, the Specifications, and the Contract will be considered as included in the unit prices for the work set forth below, and no separate payment will be made for the compliance with Each and every provision of the Proposal and Bid, the Specifications, and the Contract, unless separate payment is expressly provided for therein.

GENERAL & MISCELLANEOUS ITEMS					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
1	1	LS	Miscellaneous Construction Allowance per plans and specifications at a unit price of:	\$5,000.00	\$5,000.00
2	1	LS	Mobilization, Bonds, and Insurance per plans and specifications at a unit price of:	\$ _____	\$ _____
3	1	LS	Barricades, Signs, and Traffic Handling per plans and specifications at a unit price of:	\$ _____	\$ _____
4	1	LS	Construction Staking per plans and specifications at a unit price of:	\$ _____	\$ _____
<b>SUB TOTAL</b>				\$ _____	\$ _____

DEMOLITION ITEMS						
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE	
5	110	LF	Sawcut and Remove Curb and Gutter at New Drive Entrance at Mobberly Ave. per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
6	61	SY	Sawcut and Remove Concrete for Island Curb Construction at North tie-in per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
7	2	EACH	Reconstruct 7' Curb/Grate Inlet Top to a Solid Cover (Junction Box) per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
8	1	EACH	Reconstruct 7' Curb/Grate Inlet Top with 2'x2' Neenah Grate (Grate Inlet) and Concrete Apron in Bank Yards) per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
9	1	EACH	Construct 2' Wide Concrete Apron around Existing Grate Inlet per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
10	27	LF	Remove Chainlink Fence and Stockpile On-Site per plans and specifications at a unit price of:	dollars & cents	\$ _____	\$ _____
<b>SUB TOTAL</b>					\$ _____	\$ _____

EARTHWORK ITEMS					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
11	1	LS	Erosion and Sedimentation Control per plans and specifications at a unit price of:	\$ _____ dollars & cents	\$ _____
12	1,250	CY	Cut/Fill/Compact Using On-Site Material per plans and specifications at a unit price of:	\$ _____ dollars & cents	\$ _____
				<b>SUB TOTAL</b>	\$ _____

STORM SEWER ITEMS					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
13	1	EACH	Tie-in to Existing Inlet per plans and specifications at a unit price of:	\$ _____ dollars & cents	\$ _____
14	1	EACH	F&I 15' curb inlet per plans and specifications at a unit price of:	\$ _____ dollars & cents	\$ _____
15	53	LF	F&I 24" Diameter HDPE (includes trench safety per OSHA) per plans and specifications at a unit price of:	\$ _____ dollars & cents	\$ _____
				<b>SUB TOTAL</b>	\$ _____

PAVING ITEMS					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
16	1921	SY	8" Depth Subgrade Preparation (Scarify and Compact to 95% Standard) per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
17	1921	SY	F&I Cement for 8" Stabilization (30 lbs/SY) per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
18	1599	SY	8" Thick Concrete Paving per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
19	129	LF	F&I 24" Curb and Gutter per plans and specifications per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
20	1120	LF	F&I 6" Tall Curb per plan and specifications per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
21	78	LF	F&I 4" Tall Spill Curb per plan and specifications per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
22	5	EACH	F&I Flow Arrow Marking per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
23	38	SY	F&I 4" Thick Concrete Sidewalk per plans and specifications at a unit price of:	dollars & cents \$ _____	\$ _____
				<b>SUB TOTAL</b>	\$ _____

SITE STABILIZATION					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
24	305	CY	Offsite Import of Topsoil and 4" (Min.) Placement per plans and specifications at a unit price of: dollars & cents	\$ _____	\$ _____
25	2,367	SY	Seed and Fertilize Disturbed Areas per plans and specifications at a unit price of: dollars & cents	\$ _____	\$ _____
				<b>SUB TOTAL</b>	\$ _____

MISCELLANEOUS					
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	UNIT PRICE	TOTAL PRICE
26	330	LF	F&I 3" Diameter Schedule 40 PVC Sleeving Conduit for Electrical to Light Pole Bases per plans and specifications at a unit price of: dollars & cents	\$ _____	\$ _____
				<b>SUB TOTAL</b>	\$ _____

**BASE BID TOTAL**

---

Contractor Signature \_\_\_\_\_ Company Name \_\_\_\_\_ Date \_\_\_\_\_

ADD ALTERNATE ITEM #1				
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	TOTAL PRICE
1	84	SY	F&I 4" Thick Concrete Sidewalk along Moberly Ave. per plans and specifications at a unit price of: dollars & cents	\$ _____
2	160	LF	F&I 24" Curb and Gutter along Moberly Ave. per plans and specifications at a unit price of: dollars & cents	\$ _____
<b>TOTAL</b>				\$ _____

ADD ALTERNATE ITEM #2				
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	TOTAL PRICE
1	168	SY	F&I 4" Thick Concrete Sidewalk along New Concrete Drive (North and West Sides) per plans and specifications at a unit price of: dollars & cents	\$ _____
<b>TOTAL</b>				\$ _____

ALTERNATE CONCRETE PAVEMENT SECTION (REPLACES ITEM #18 FROM BASE BID)				
ITEM	QTY	UNIT	BID ITEM DESCRIPTION WITH UNIT PRICES IN WORDS	TOTAL PRICE
1	1599	SY	9" Thick Concrete Paving per plans and specifications at a unit price of: dollars & cents	\$ _____
<b>TOTAL</b>				\$ _____

**PROPOSAL: LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

The undersigned Bidder hereby agrees to begin work under the contract on or before the date to be specified in the written Notice to Proceed and to fully complete the project within **90** consecutive calendar days. The undersigned Bidder further agrees to pay, as liquidated damages, the sum of **\$470.00** for each consecutive calendar day thereafter as provided in Item 7 of the Information for Bidders.

The undersigned Bidder has contacted, within 72 hours prior to this bid opening, the office of the \_\_\_\_\_ and has determined that all Addenda are as follows:

Addendum No. 1, dated \_\_\_\_\_; \_\_\_\_\_

Addendum No. 2, dated \_\_\_\_\_; \_\_\_\_\_

The undersigned Bidder acknowledges and agrees that this Proposal shall be good and may not be withdrawn for a period of 90 calendar days from the date of this bid opening.

The undersigned Bidder is obligated to and shall show accurate unit prices as well as total amounts, and agrees that in the case of ambiguity between unit prices and total amounts or in the case of any other ambiguity the Owner may interpret an ambiguity in a manner most advantageous to the Owner or reject the bid.

The undersigned Bidder further acknowledges and agrees that a bid that has been opened may not be changed for the purpose of correcting an error in the final bid price.

The undersigned Bidder agrees to execute the Contract Agreement and furnish the required Performance Bond, Payment Bond, and Maintenance Bond within 15 calendar days from the date of acceptance of the Proposal.

The undersigned Bidder has attached and made a part of this Proposal a bid security in conformance with Item 5 of the Information for Bidders.

Submitted by:

\_\_\_\_\_  
(Signature) (Firm)

\_\_\_\_\_  
(Name - Typed or Printed) (Address)

\_\_\_\_\_  
(Title) (City, County, State, Zip Code)

\_\_\_\_\_  
Attest - Date) (Area Code-Telephone Number)

\_\_\_\_\_  
(Corporation Seal) (Fax Number)

**VENDOR COMPLIANCE TO STATE LAW**

The 1985 Session of the Texas Legislature passed House Bill 620 relative to the award of contracts to non-resident bidders. This law provides that, in order to be awarded a contract as low bidder, non-resident bidders (out-of-state contractors whose corporate offices or principal place of business are outside of the state of Texas) bid projects for construction, improvements, supplies or services in Texas at an amount lower than the lowest Texas resident bidder by the same amount that a Texas resident bidder would be required to under bid a non-resident bidder in order to obtain a comparable contract in the state in which the non-resident's principal place of business is located. The appropriate blanks in Section A must be filled out by all out-of-state or non-resident bidders in order for your bid to meet specifications. The failure of out-of-state or non-resident contractors to do so will automatically disqualify that bidder. Resident bidders must check the blank in Section B.

A. Non-resident vendors in \_\_\_\_\_ (insert state), our principal place of business, are required to be \_\_\_\_\_ percent lower than resident bidders by state law. A copy of the statute is attached.

Non-resident vendors in \_\_\_\_\_ (insert state), our principal place of business, are not required to underbid resident bidders.

B. \_\_\_\_\_ Our principal place of business or corporate offices are in the State of Texas.

BIDDER:

\_\_\_\_\_  
(company)

By: \_\_\_\_\_  
(signature)

\_\_\_\_\_  
(address)

\_\_\_\_\_  
(print name)

\_\_\_\_\_  
(city, state, zip)

\_\_\_\_\_  
(title)

**THIS FORM MUST BE INCLUDED WITH YOUR SEALED BID**

**STANDARD FORM OF AGREEMENT**

Approved as to Legal Form by  
City of Longview Legal Counsel

STATE OF TEXAS }  
COUNTY OF GREGG }

THIS AGREEMENT, made and entered into this \_\_\_\_ day of \_\_\_\_\_, A.D. 2015, by and between the City of Longview of the County of Gregg and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed OWNER, and \_\_\_\_\_ of the City of Longview, County of Gregg and State of Texas, Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Party of the First Part (OWNER), and under the conditions expressed in the bond bearing even date herewith, the said Party of the Second Part (CONTRACTOR), hereby agrees with the said Party of the First Part (OWNER) to commence and complete the construction of certain improvements described as follows:

**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

and all extra work in connection therewith, under the terms as stated in this Standard Form of Agreement; all of the documents attached to this Standard Form of Agreement; all Plans, Specifications and drawings for the LONGVIEW MULTIMODAL TRANSPORTATION CENTER, as prepared by the OWNER’s engineer (herein entitled “ENGINEER”); and all printed or written explanatory materials of said Plans, Specifications and drawings. The CONTRACTOR hereby agrees with the OWNER that the CONTRACTOR shall commence and complete all such construction and work at the CONTRACTOR’s own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction and work.

The documents that are attached to and for all purposes made part of this Standard Form of Agreement include the Advertisement for Bids, Notice to Bidders, Information for Bidders, Liquidated Damages, Certificate of Final Completion, Wage Rates, Proposal, Bid Bond, Vendor Compliance to State Law, Performance Bond, Payment Bond, Maintenance Bond, Statement of Materials, Certificate of Insurance, General Conditions, Special Conditions, Technical Specifications and Attachment 1 Geotechnical Report. This agreement shall also include all Plans, Specifications and drawings for the LONGVIEW MULTIMODAL TRANSPORTATION CENTER, as prepared by the ENGINEER, and all printed or written explanatory materials of said Plans, Specifications and drawings. This Standard Form of Agreement and the documents listed herein shall collectively evidence and constitute the entire contract between the parties hereto regarding the subject matter hereof.

The CONTRACTOR hereby agrees to commence work within ten (10) days after the date written notice to do so shall have been given to him, and to complete the same within 90 calendar days after the date of the written notice to commence work, subject to such extensions of time as are provided by the General and Special Conditions of Agreement.

CONTRACTOR's failure to timely commence work or diligently pursue completion of the work within the time limitations set out herein shall constitute a material breach of this contract. **TIME IS OF THE ESSENCE IN THE PERFORMANCE OF THIS CONTRACT.**

The OWNER agrees to pay the CONTRACTOR in current funds the price or prices shown in the Proposal, which forms a part of this contract, such payments to be subject to the terms and conditions of this contract, including without limitation the General and Special Conditions of Agreement.

Without regard to and notwithstanding any rules on conflicts of law, this contract shall be subject to and interpreted in conformance with the laws of the State of Texas, unless expressly required otherwise by federal law or regulations. Venue for any action arising hereunder shall lie exclusively in Gregg County, Texas, for actions in state court and in the Eastern District of Texas, Tyler Division, for actions in federal court.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in the year and day first above written.

City of Longview  
Party of the First Part (OWNER)

\_\_\_\_\_  
Party of the Second Part (CONTRACTOR)

By:\_\_\_\_\_

By:\_\_\_\_\_

ATTEST:

ATTEST:

\_\_\_\_\_  
(Seal)

\_\_\_\_\_  
(Seal)

**PERFORMANCE BOND**

STATE OF TEXAS  
COUNTY OF GREGG

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
of the City of \_\_\_\_\_ County of \_\_\_\_\_, and State  
of \_\_\_\_\_, as principal, and  
\_\_\_\_\_ authorized under the laws of the  
State of Texas to act as surety on bonds for principals, are held and firmly bound unto the City of  
Longview, Texas (Owner), in the penal sum of: \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$\_\_\_\_\_) for the  
payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators,  
executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated  
the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, to complete

**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

which contract is hereby referred to and made a part hereof as fully and to the same extent as if  
copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said  
Principal shall faithfully perform said Contract and shall in all respects duly and faithfully observe  
and perform all and singular the covenants, conditions and agreements in and by said contract agreed  
and covenanted by the Principal to be observed and performed, and according to the true intent and  
meaning of said Contract and the Plans and Specifications hereto annexed, then this obligation shall  
be void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter  
2253 of the Texas Government Code, as amended, and all liabilities on this bond shall be determined  
in accordance with the provisions of said Chapter to the same extent as if it were copied at length  
herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration  
or addition to the terms of the contract, or to the work performed thereunder, or the plans,  
specifications, or drawings accompanying the same, shall in anywise affect its obligation on this  
bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to

the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Surety

By \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The name and address of the Resident Agent of Surety is: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**PAYMENT BOND**

STATE OF TEXAS  
COUNTY OF GREGG

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
of the City of \_\_\_\_\_ County of \_\_\_\_\_, and  
State of \_\_\_\_\_, as principal, and  
\_\_\_\_\_ authorized under the laws of the State of Texas to act as  
surety on bonds for principals, are held and firmly bound unto the City of Longview, Texas (Owner),  
in the penal sum of: \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$\_\_\_\_\_) for  
the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators,  
executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated  
the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, to construct

**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

which contract is hereby referred to and made a part hereof as fully and to the same extent as if  
copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said  
Principal shall pay all claimants supplying labor and material to him or a subcontractor in the  
prosecution of the work provided for in said contract, then, this obligation shall be void; otherwise to  
remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter  
2253 of the Texas Government Code, as amended, and all liabilities on this bond shall be determined  
in accordance with the provisions of said Chapter to the same extent as if it were copied at length  
herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration  
or addition to the terms of the contract, or to the work performed thereunder, or the plans,  
specifications, or drawings accompanying the same, shall in anywise affect its obligation on this  
bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to  
the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this  
instrument this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Principal

By \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Surety

By \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The name and address of the Resident Agent of Surety is: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**ONE-YEAR MAINTENANCE BOND**

STATE OF TEXAS §

COUNTY OF GREGG §

KNOW ALL MEN BY THESE PRESENTS:

That we, \_\_\_\_\_  
as Principal, hereinafter called "Contractor", and the other subscriber hereto as Surety, do hereby  
acknowledge ourselves to be held and firmly bound to the City of Longview, a municipal  
corporation, in the sum of \_\_\_\_\_  
\_\_\_\_\_ DOLLARS (\$\_\_\_\_\_)  
for the payment of which sum well and truly to be made to the City of Longview, and its successors,  
the said Contractor and Surety do bind themselves, their successors and assigns jointly and severally.  
The conditions of this obligation are such that:

WHEREAS, the said Contractor has entered into a contract in writing with the City of  
Longview, Texas, dated of even date herewith, for completion of

**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

all of such work to be done as set out in full in said contract and the plans and specifications therein  
referred to.

NOW, THEREFORE, if the said Contractor shall repair, replace and restore any and all  
defects in or damages to said construction, occasioned by, and resulting within one (1) year from and  
after the day of the acceptance of said work by said City of Longview from defects in materials  
furnished by, or workmanship of the Contractor, in performing the work covered by said contract,  
then this obligation shall become null and void, and shall be of no further force and effect; otherwise,  
the same is to remain in full force and effect.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument on the respective dates written below their signatures.

ATTEST/SEAL: (if a corporation)

WITNESS: (if not a corporation)

\_\_\_\_\_  
(Principal)

\_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_

\_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

\_\_\_\_\_  
(Full Name of Surety)

ATTEST/WITNESS:

\_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_

\_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

- SP-13. **EXISTING FACILITIES.** Whether shown on the plans or not, the Contractor shall be completely responsible for the protection or replacement of all facilities within the project area and in connection with the work.
- SP-14. **GUARANTEE.** As a part of this project, the Contractor shall guarantee all materials and workmanship and shall repair or remove and replace any defective condition as determined by the Engineer. Such guarantee shall be effective for a period of one year from the date of written acceptance by the Owner or date of final payment whichever is first. The maintenance bond shall be in full effect throughout the warranty period.
- SP-15. **STATE SALES TAX.** The Contractor's attention is directed to paragraph No. 3 of Ruling No. 9 by obtaining the necessary permit or permits from the State Comptroller allowing the purchase of materials for incorporation in this project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase. Such bidders must submit segregated prices for the total cost of materials and total cost of services, and the successful bidder must require his sub-contractors to obtain such permits and to sign written sub-contracts in which the prices are segregated for the total cost of materials and the total cost of services. Total materials cost should not include materials which are used or consumed in performing the work, but do not become a part of the completed installation.

After the bid opening and prior to execution of contract, the low bidder will be required to provide a separation of materials costs and labor costs for the amounts of the base bid and any alternatives. The following form shall be used to provide this information. This form shall be submitted in six(6) copies with the executed contract and such statement will become a part of the contract:

**STATEMENT OF MATERIALS AND SERVICES**

City of Longview

Project Name: \_\_\_\_\_  
 \_\_\_\_\_

Total Materials Cost: \$ \_\_\_\_\_  
 Total Service Cost: \$ \_\_\_\_\_

TOTAL CONTRACT PRICE: \$ \_\_\_\_\_

Note: The total materials cost plus the total services cost must equal the amount shown of the total contract price.

- SP-16. **CLEANUP.** The entire project site shall be left in as good or better condition as the condition at the time construction is started, all as approved by the Engineer. All cleanup shall be completed within the time specified for the project construction and

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## GENERAL CONDITIONS OF AGREEMENT

### 1. DEFINITIONS OF TERMS

**1.01 OWNER, CONTRACTOR AND ENGINEER.** The OWNER, the CONTRACTOR, and the ENGINEER are those persons or organizations identified as such in the Agreement and are referred to throughout the contract Documents as if singular in number and masculine in gender. The term ENGINEER means the ENGINEER or his duly authorized representative. The ENGINEER shall be understood to be the ENGINEER of the OWNER, and nothing contained in the Contract Documents shall create any contractual or agency relationship between the ENGINEER and the CONTRACTOR.

**1.02 CONTRACT DOCUMENTS.** The Contract Documents shall consist of the Notice to Contractors (Advertisement), Special Conditions (Instructions to Bidders), Proposal, Signed Agreement, Performance and Payment Bonds (when required), Special Bonds (when required), General Conditions of the Agreement, Plans, Technical Specifications, and all modifications thereof incorporated in any of the documents before the execution of the agreement.

The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. In case of conflict between any of the Contract Documents, priority of interpretation shall be in the following order: Signed Agreement, Performance and Payment Bonds, Special Bonds (if any), Proposal, Special Conditions of Agreement, Notice to Contractors, Technical Specifications, Plans, and General Conditions of Agreement.

**1.03 SUB-CONTRACTOR.** The term Sub-Contractor, as employed herein, includes only those having a direct contract with the CONTRACTOR and it includes one who furnished material worked to a special design according to the plans or specifications of this work, but does not include one who merely furnished material not so worked.

**1.04 WRITTEN NOTICE.** Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, delivered by electronic fax, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

**1.05 WORK.** The CONTRACTOR shall provide and pay for all materials, supplies, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, light, power, fuel, transportation and other facilities necessary for the execution and completion of the work covered by the contract documents. Unless otherwise specified, all materials shall be new and both workmanship and materials shall be of a good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials. Materials or work described in words which so applied have a well known technical or trade meaning shall be held to refer to such recognized standards.

**1.06 EXTRA WORK.** The term "Extra Work" as used in this contract shall be understood to mean and include all work that may be required by the ENGINEER or OWNER to be done by the CONTRACTOR to accomplish any change, alteration or addition to the work shown upon the plans, or reasonably implied by the specifications, and not covered by the CONTRACTOR'S proposal, except as provided under "Changes and Alterations", herein.

**1.07 WORKING DAY.** A “Working Day” is defined as any day not including Saturdays, Sundays or any legal holidays, in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of the work for a period of not less than seven (7) hours between 7:00 a.m. and 6:00 p.m.

**1.08 CALENDAR DAY.** “Calendar Day” is any day of the week or month, no days being excepted.

**1.09 SUBSTANTIALLY COMPLETED.** By the term “substantially completed” is meant that the structure has been made suitable for use or occupancy or the facility is in condition to serve its intended purpose, but still may require minor miscellaneous work and adjustment.

## **2. RESPONSIBILITIES OF THE ENGINEER AND THE CONTRACTOR.**

**2.01 OWNER-ENGINEER RELATIONSHIP.** The ENGINEER will be the OWNER’S representative during construction. The duties, responsibilities and limitations of authority of the ENGINEER as the OWNER’S representative during construction are as set forth in the Contract Documents and shall not be extended or limited without written consent of the OWNER and ENGINEER. The ENGINEER will advise and consult with the OWNER, and all of OWNER’S instructions to the CONTRACTOR shall be issued through the ENGINEER.

**2.02 PROFESSIONAL INSPECTION BY ENGINEER.** The ENGINEER shall make periodic visits to the site to familiarize himself generally with the progress of the executed work and to determine if such work generally meets the essential performance and design features and the technical and functional engineering requirements of the Contract documents; provided and except, however, that the ENGINEER shall not be responsible for making any detailed, exhaustive, comprehensive or continuous on-site inspection of the quality or quantity of the work or be in any way responsible, directly or indirectly, for the construction means, methods, techniques, sequences, quality, procedures, programs, safety precautions or lack of same incident thereto or in connection therewith. Notwithstanding any other provision of this agreement or any other contract document, the ENGINEER shall not be in any way responsible or liable for any acts, errors, omissions, or negligence of the CONTRACTOR, any subcontractor or any of the CONTRACTOR’S or subcontractor’s agents, servants or employees or any other person, firm or corporation performing or attempting to perform any of the work.

**2.03 PAYMENTS FOR WORK.** The ENGINEER shall review CONTRACTOR’S applications for payment and supporting data, determine the amount owed to the CONTRACTOR and recommend to OWNER, in writing, payment to CONTRACTOR in such amounts. Such recommendation of payment of CONTRACTOR’S application for payment constitutes a representation to the OWNER of ENGINEER’S professional judgement that the work has progressed to the point indicated to the best of his knowledge, information and belief, but such recommendation of payment of an application for payment to CONTRACTOR shall not be deemed as a representation by ENGINEER that ENGINEER has made any examination to determine how or for what purpose CONTRACTOR has used the moneys paid on account of the Contract price. Further, ENGINEER’S determination of the amount owed to the CONTRACTOR and recommendation of payment shall both be advisory only and shall not be binding upon OWNER.

**2.04 DISPUTE DETERMINATIONS.** The ENGINEER initially shall determine all claims, disputes and other matters in question between the CONTRACTOR and the OWNER

relating to the execution or progress of the work or the interpretation of the Contract Documents and the ENGINEER'S decision shall be rendered in writing within a reasonable time.

**2.05 LINES AND GRADES.** Unless otherwise specified, all lines and grades shall be furnished by the ENGINEER or his representative. Whenever necessary, construction work shall be suspended to permit performance of this work, but such suspension will be as brief as practicable and the CONTRACTOR shall be allowed no extra compensation therefor. The CONTRACTOR shall give the ENGINEER ample notice of the time and place where lines and grades will be needed. All stakes, marks, etc., shall be carefully preserved by the CONTRACTOR, and in case of careless destruction or removal by him or his employees, such stakes, marks, etc., shall be replaced at the CONTRACTOR'S expense.

**2.06 CONTRACTOR'S DUTY AND SUPERINTENDENCE.** The CONTRACTOR shall give adequate attention to the faithful prosecution and completion of this contract and shall keep on the work, during its progress, a competent superintendent and any necessary assistants. The superintendent shall represent the CONTRACTOR in his absence and all directions given to him shall be as binding as if given to the CONTRACTOR.

The CONTRACTOR is and at all times shall remain an independent contractor, solely responsible for the manner and method of completing his work under this contract, with full power and authority to select the means, method and manner of performing such work, so long as such methods do not adversely affect the completed improvements, the OWNER and ENGINEER being interested only in the result obtained and conformity of such completed improvements to the plans, specifications and contract.

Likewise, the CONTRACTOR shall be solely responsible for the safety of himself, his employees and other persons, as well as for the protection of the safety of the improvements being erected and the property of himself or any other person, as a result of his operations hereunder. Engineering construction drawings and specifications as well as any additional information concerning the work to be performed passing from or through the ENGINEER shall not be interpreted as requiring or allowing CONTRACTOR to deviate from the plans and specifications, the intent of such drawings, specifications and any other such instructions being to define with particularity the agreement of the parties as to the work the CONTRACTOR is to perform. CONTRACTOR shall be fully and completely liable, at his own expense, for design, construction, installation and use, or non-use, of all items and methods incident to performance of the contract, and for all loss, damage or injury incident thereto, either to person or property, including, without limitation, the adequacy of all temporary supports, shoring, bracing, scaffolding, machinery or equipment, safety precautions or devices, and similar items or devices used by him during construction.

Any review of work in process, or any visit or observation during construction, or any clarification of plans and specifications, by the ENGINEER, or any agent, employee, or representative of either of them, whether through personal observation on the project site or by means of approval of shop drawings for temporary construction or construction processes, or by other means or method, is agreed by the CONTRACTOR to be for the purpose of observing the extent and nature of work completed or being performed, as measured against the drawings and specifications constituting the contract, or for the purpose of enabling CONTRACTOR to more fully understand the plans and specifications so that the completed construction work will conform thereto, and shall in no way relieve the CONTRACTOR from full and complete responsibility for the proper performance of his work on the project, including but without

limitation the propriety of means and methods of the CONTRACTOR in performing said contract, and the adequacy of any designs, plans or other facilities for accomplishing such performance. Deviation by the CONTRACTOR from plans and specifications that may have been in evidence during any such visitation or observation by the ENGINEER, or any of his representatives, whether called to the CONTRACTOR'S attention or not shall in no way relieve CONTRACTOR from his responsibility to complete all work in accordance with said plans and specifications.

**2.07 CONTRACTOR'S UNDERSTANDING.** It is understood and agreed that the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent or employee of the OWNER or ENGINEER either before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.

**2.08 CHARACTER OF WORKMEN.** The CONTRACTOR agrees to employ only orderly and competent men, skillful in the performance of the type of work required under this contract, to do the work; and agrees that whenever the ENGINEER shall inform him in writing that any man or men on the work are, in his opinion, incompetent, unfaithful or disorderly, such man or men shall be discharged from the work and shall not again be employed on the work without the ENGINEER'S written consent.

**2.9 CONTRACTOR'S BUILDINGS.** The building of structures for housing men, or the erection of tents or other forms of protection, will be permitted only at such places as the ENGINEER shall direct, and the sanitary conditions of the grounds in or about such structures shall at all times be maintained in a manner satisfactory to the ENGINEER.

**2.10 SANITATION.** Necessary conveniences for the use of laborers on the work, properly secluded from public observation, shall be constructed and maintained by the CONTRACTOR in such manner and at such points as shall be approved by the ENGINEER, and their use shall be strictly enforced.

**2.11 SHOP DRAWINGS.** The CONTRACTOR shall submit to the ENGINEER, with such promptness as to cause no delay in his own work or in that of any other Contractor, four checked copies, unless otherwise specified, of all shop and/or setting drawings and schedules required for the work of the various trades, and the ENGINEER shall pass upon them with reasonable promptness, making desired corrections. The CONTRACTOR shall make any corrections required by the ENGINEER, file with him two corrected copies and furnish such other copies as may be needed. The ENGINEER'S approval of such drawings or specification, unless he has in writing called the ENGINEER'S attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules. It shall be the CONTRACTOR'S responsibility to fully and completely review all shop drawings to ascertain their effect on his ability to perform the required contract work in accordance with the plans and specifications and within the contract time.

Such review by the ENGINEER shall be for the sole purpose of determining the sufficiency of said drawings or schedules to result in finished improvements in conformity with the plans and specifications, and shall not relieve the CONTRACTOR of his duty as an independent

contractor as previously set forth, it being expressly understood and agreed that the ENGINEER does not assume any duty to pass upon the propriety or adequacy of such drawings or schedules, or any means or methods reflected thereby, in relation to the safety of either person or property during CONTRACTOR'S performance hereunder.

**2.12 PRELIMINARY APPROVAL.** The ENGINEER shall not have the power to waive the obligations of this contract for the furnishing by the CONTRACTOR of good material, and of his performing good work as herein described, and in full accordance with the plans and specifications. No failure or omission of the ENGINEER to discover, object to or condemn any defective work or material shall release the CONTRACTOR from the obligations to fully and properly perform the contract, including without limitations, the obligation to at once tear out, remove and properly replace the same at any time prior to final acceptance upon the discovery of said defective work or material; provided, however, that the ENGINEER shall, upon request of the CONTRACTOR, inspect and accept or reject any material furnished, and in event the material has been once accepted by the ENGINEER, such acceptance shall be binding on the OWNER, unless it can be clearly shown that such material furnished does not meet the specifications for this work.

Any questioned work may be ordered taken up or removed for re-examination, by the ENGINEER, prior to final acceptance, and if found not in accordance with the specifications for said work, all expense of removing, re-examination and replacement shall be borne by the CONTRACTOR, otherwise the expense thus incurred shall be allowed as EXTRA WORK, and shall be paid for by the OWNER; provided that, where inspection or approval is specifically required by the specifications prior to performance of certain work, should the CONTRACTOR proceed with such work without requesting prior inspection or approval he shall bear all expense of taking up, removing, and replacing this work if so directed by the ENGINEER.

**2.13 DEFECTS AND THEIR REMEDIES.** It is further agreed that if the work or any part thereof, or any material brought on the site of the work for use in the work or selected for the same, shall be deemed by the ENGINEER as unsuitable or not in conformity with the specifications, the CONTRACTOR shall, after receipt of written notice thereof from the ENGINEER, forthwith remove such material and rebuild or otherwise remedy such work so that it shall be in full accordance with this contract.

**2.14 CHANGES AND ALTERATIONS.** The CONTRACTOR further agrees that the OWNER may make such changes and alterations as the OWNER may see fit, in the line, grade, form, dimensions, plans or materials for the work herein contemplated, or any part thereof, either before or after the beginning of the construction, without affecting the validity of this contract and the accompanying Performance, Payment, and Maintenance Bonds.

If such changes or alterations diminish the quality of the work to be done, they shall not constitute the basis for a claim for damages, or anticipated profits on the work that may be dispensed with, except as provided for unit price items under Section 5 "Measurement and Payment." If the amount of work is increased, and the work can fairly be classified under the specifications, such increase shall be paid for according to the quantity actually done and at the unit price, if any, established for such work under this contract, except as provided for unit price items under Section 5 "Measurement and Payment;" otherwise, such additional work shall be paid for as provided under Extra Work. In case the OWNER shall make such changes or alterations as shall make useless any work already done or material already furnished or used in said work, then the OWNER shall recompense the CONTRACTOR for any material or labor so

used, and for any actual loss occasioned by such change, due to actual expenses incurred in preparation for the work as originally planned.

### **3. GENERAL OBLIGATIONS AND RESPONSIBILITIES**

**3.01 KEEPING PLANS AND SPECIFICATIONS ACCESSIBLE.** The ENGINEER shall furnish the CONTRACTOR with an adequate and reasonable number of copies of all plans and specifications without expense to him, and the CONTRACTOR shall keep one copy of the same constantly accessible on the work, with the latest revisions noted thereon.

**3.02 OWNERSHIP OF DRAWINGS.** All drawings, specifications and copies thereof furnished by the ENGINEER shall not be reused on other work, and, with the exception of the signed contract sets, are to be returned to him on request, at the completion of the work. All models are the property of the OWNER.

**3.03 ADEQUACY OF DESIGN.** It is understood that the OWNER believes it has employed competent engineers and designers. It is, therefore, agreed that the OWNER shall be responsible for the adequacy of the design, sufficiency of the Contract Documents, the safety of the structure and the practicability of the operations of the completed project; provided the CONTRACTOR has complied with the requirements of the said Contract Documents, all approved modifications thereof, and additions and alterations thereto approved in writing by the OWNER. The burden of proof of such compliance shall be upon the CONTRACTOR to show that he has complied with the said requirements of the Contract Documents, approved modifications thereof and all approved additions and alterations thereto.

**3.04 RIGHT OF ENTRY.** The OWNER reserves the right to enter the property or location on which the works herein contracted for are to be constructed or installed, by such agent or agents as he may elect, for the purpose of inspecting the work, or for the purpose of constructing or installing such collateral work as said OWNER may desire.

**3.05 COLLATERAL CONTRACTS.** The OWNER agrees to provide by separate contract or otherwise, all labor and material essential to the completion of the work specifically excluded from this contract, in such manner as not to delay the progress of the work, or damage said CONTRACTOR, except where such delays are specifically mentioned elsewhere in the Contract Documents.

**3.06 DISCREPANCIES AND OMISSIONS.** It is further agreed that it is the intent of this contract that all work must be done and all material must be furnished in accordance with the generally accepted practice, and in the event of any discrepancies between the separate contract documents, the priority of interpretation defined under "Contract Documents" shall govern. In the event that there is still any doubt as to the meaning and intent of any portion of the contract, specifications or drawings, the ENGINEER shall define which is intended to apply to the work.

**3.07 EQUIPMENT, MATERIALS AND CONSTRUCTION PLANT.** The CONTRACTOR shall be responsible for the care, preservation, conservation, and protection of all materials, supplies, machinery, equipment, tools, apparatus, accessories, facilities, all means of construction, and any and all parts of the work, whether the CONTRACTOR has been paid, partially paid, or not paid for such work, until the entire work is completed and accepted.

**3.08 DAMAGES.** In the event the OWNER is damaged in the course of the work by the act,

negligence, omission, mistake or default of the CONTRACTOR, or should the CONTRACTOR unreasonably delay the progress of the work being done by others on the job so as to cause loss for which the OWNER becomes liable, then the CONTRACTOR shall reimburse the OWNER for such loss.

**3.09 PROTECTION AGAINST ACCIDENT TO EMPLOYEES AND THE PUBLIC.**

The CONTRACTOR shall at all times exercise reasonable precautions for the safety of employees and others on or near the work and shall comply with all applicable provisions of Federal, State, and Municipal safety laws and building and construction codes. All machinery and equipment and other physical hazards shall be guarded in accordance with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America except where incompatible with Federal, State, or Municipal laws or regulations. The CONTRACTOR shall provide such machinery guards, safe walkways, ladders, bridges, gangplanks, and other safety devices. The safety precautions actually taken and their adequacy shall be the sole responsibility of the CONTRACTOR, acting at his discretion as an independent contractor.

**3.10 PERFORMANCE, PAYMENT & MAINTENANCE BONDS.** Unless otherwise specified, it is further agreed by the parties to this Contract that the CONTRACTOR will execute separate performance, payment, and maintenance bonds, each in the sum of one hundred (100) percent of the total contract price, in standard forms for this purpose, guaranteeing faithful performance of the work and the fulfillment of any guarantees required, and further guaranteeing payment to all persons supplying labor and materials or furnishing him any equipment in the execution of the contract, and it is agreed that this Contract shall not be in effect until such performance, payment, and maintenance bonds are furnished and approved by the OWNER.

Unless otherwise approved in writing by the OWNER, the surety company underwriting the bonds shall be acceptable according to the latest list of companies holding certificates of authority from the Secretary of the Treasury of the United States.

Unless otherwise specified, the cost of the premium for the performance and payment bonds shall be included in the CONTRACTOR'S proposal

**3.11 LOSSES FROM NATURAL CAUSES.** Unless otherwise specified, all loss or damage to the CONTRACTOR arising out of the nature of the work to be done, or from the action of the elements, or from any unforeseen circumstance in the prosecution of the same, or from unusual obstructions or difficulties which may be encountered in the prosecution of the work, shall be sustained and borne by the CONTRACTOR at his own cost and expense.

**3.12 PROTECTION OF ADJOINING PROPERTY.** The said CONTRACTOR shall take proper means to protect the adjacent or adjoining property or properties in any way encountered, which might be injured or seriously affected by any process of construction to be undertaken under this Agreement, from any damage or injury by reason of said process of construction; and he shall be liable for any and all claims for such damage on account of his failure to fully protect all adjoining property. The CONTRACTOR agrees to indemnify, save and hold harmless the OWNER and ENGINEER against any claim or claims for damages due to any injury to any adjacent or adjoining property, arising or growing out of the performance of the contract; but any such indemnity shall not apply to any claim of any kind arising out of the existence or character of the work.

**3.13 PROTECTION AGAINST CLAIMS OF SUB-CONTRACTORS, LABORERS, MATERIALMEN AND FURNISHERS OF MACHINERY, EQUIPMENT AND SUPPLIES.** The CONTRACTOR agrees that he will indemnify and save the OWNER and ENGINEER harmless from all claims growing out of the lawful demands of sub-contractors, laborers, workmen, mechanics, materialmen and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. When so desired by the OWNER, the CONTRACTOR shall furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged or waived. If the CONTRACTOR fails so to do, then the OWNER may at the option of the CONTRACTOR either pay directly any unpaid bills of which the OWNER has written notice, or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to liquidate any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to the CONTRACTOR shall be resumed in full, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligation upon the OWNER by either the CONTRACTOR or his Surety.

**3.14 PROTECTION AGAINST ROYALTIES OR PATENTED INVENTION.** The CONTRACTOR shall pay all royalties and license fees, and shall provide for the use of any design, device, material or process covered by letters patent or copyright by suitable legal agreement with the patentee or owner. The CONTRACTOR shall defend all suits or claims for infringement of any patent or copyright rights and shall indemnify and save the OWNER and ENGINEER harmless from any loss on account thereof, except that the OWNER shall defend all such suits and claims and shall be responsible for all such loss when a particular design, device, material or process or the product of a particular manufacturer or manufacturers is specified or required by the OWNER; provided, however, if choice of alternate design, device, material or process is allowed to the CONTRACTOR, then CONTRACTOR shall indemnify and save OWNER harmless from any loss on account thereof. If the material or process specified or required by the OWNER is an infringement, the CONTRACTOR shall be responsible for such loss unless he promptly gives such information to the OWNER.

**3.15 LAWS AND ORDINANCES.** The CONTRACTOR shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations, which in any manner affect the contract or the work, and shall indemnify and save harmless the OWNER and ENGINEER against any claim arising from the violation of any such laws, ordinances, and regulations whether by the CONTRACTOR or his employees, except where such violations are called for by the provisions of the contract Documents. If the CONTRACTOR observes that the plans and specifications are at variance therewith, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the CONTRACTOR performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the ENGINEER, he shall bear all costs arising therefrom. In case the OWNER is a body politic and corporate, the law from which it derives its powers, insofar as the same regulates the objects for which, or the manner in which, or the conditions under which the OWNER may enter into contract, shall be controlling, and shall be considered as part of this contract, to the same effect as though embodied herein.

**3.16 ASSIGNMENT AND SUBLETTING.** The CONTRACTOR further agrees that he will retain personal control and will give his personal attention to the fulfillment of this contract and that he will not assign by Power of Attorney, or otherwise, or sublet said contract without the written consent of the ENGINEER, and that no part or feature of the work will be sublet to

anyone objectionable to the ENGINEER or the OWNER. The CONTRACTOR further agrees that the subletting of any portion or feature of the work, or materials required in the performance of this contract, shall not relieve the CONTRACTOR from his full obligations to the OWNER, as provided by this Agreement.

**3.17 INDEMNIFICATION.** The CONTRACTOR shall defend, indemnify and hold harmless the OWNER and the ENGINEER and their respective officers, agents and employees, from and against all damages, claims, losses, demands, suits, judgments and costs, including reasonable attorneys' fees and expenses, arising out of or resulting from the performance of the work, provided that any such damages, claim, loss, demand, suit, judgment, cost or expense:

- (1) is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom; and,
- (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any one of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

The obligation of the CONTRACTOR under this Paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, drawings, reports, surveys, Change Orders, designs or specifications, or the giving of or the failure to give directions or instructions by the ENGINEER, his agents or employees, provided such giving or failure to give is the primary cause of the injury or damage.

**3.18 INSURANCE.** The CONTRACTOR at his own expense shall purchase, maintain and keep in force such insurance as will protect him from claims set for the below which may arise out of or result from the CONTRACTOR'S operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- (1) workmen's compensation claims, disability benefits and other similar employee benefit acts;
- (2) claims for damages because of bodily injury, personal injury, occupational sickness or disease, or death of his employees, and claims insured by usual bodily injury liability coverages;
- (3) claims for damages because of bodily injury, personal injury, sickness or disease, or death of any person other than his employees, and claims insured by usual bodily injury liability coverages; and
- (4) claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

**3.18.1 CERTIFICATE OF INSURANCE.** Before commencing any of the work, CONTRACTOR shall file with the OWNER valid Certificates of Insurance acceptable to the OWNER and the ENGINEER. Such Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least ten days prior written notice has been given to the OWNER.

The CONTRACTOR shall also file with the OWNER valid Certificates of Insurance covering all sub-contractors.

#### **4. PROSECUTION AND PROGRESS**

**4.01 TIME AND ORDER OF COMPLETION.** It shall be the responsibility of the CONTRACTOR to commence work within ten(10) days after the date of written notice to proceed, and to diligently prosecute the project to completion within the time set out herein. This responsibility to proceed diligently shall not be interpreted as OWNER'S right to dictate CONTRACTOR'S order of precedence in performance of the work; provided, however, that the order and the time of prosecution shall be such that the work shall be substantially completed as a whole and in part, in accordance with this contract, the plans and specifications, and within the time of completion designated in the Proposal; provided, also, that when the OWNER is having other work done, either by contract or by his own force, the ENGINEER may direct the time and manner of constructing the work done under this contract, so that conflict will be avoided and the construction of the various works being done for the OWNER shall be harmonized.

The CONTRACTOR shall submit, at such times as may reasonably be requested by the ENGINEER, schedules which shall show the order in which the CONTRACTOR proposes to carry on the work, with dates at which the CONTRACTOR will start the several parts of the work, and estimated dates of completion of the several parts.

**4.02 EXTENSION OF TIME.** Should the CONTRACTOR be delayed in the completion of the work by any act or neglect of the OWNER or ENGINEER, or of any employee of either, or by other contractors employed by the OWNER, or by changes ordered in the work, or by strikes, lockouts, fires, and unusual delays by common carriers, or unavoidable cause or causes beyond the CONTRACTOR'S control, or by any cause which the ENGINEER shall decide justifies the delay, then an extension of time shall be allowed for completing the work, sufficient to compensate for the delay, the amount of the extension to be determined by the ENGINEER, provided, however, that the CONTRACTOR shall give the ENGINEER prompt notice in writing of the cause of such delay.

**4.03 HINDRANCES AND DELAYS.** No claims shall be made by the CONTRACTOR for damages resulting from hindrances or delays from any cause (except where the work is stopped by order of the OWNER) during the progress of any portion of the work embraced in this contract. In case said work shall be stopped by the act of the OWNER, then such expense as in the judgment of the ENGINEER is caused by such stoppage of said work shall be paid by the OWNER to the CONTRACTOR; provided, however, that OWNER shall not be responsible for damages attributable to work stoppages by OWNER in the instance of CONTRACTOR'S failure to timely perform as set out in Paragraph 7 of these General Conditions.

#### **5. MEASUREMENT AND PAYMENT**

**5.01 QUANTITIES AND MEASUREMENTS.** No extra or customary measurements of any kind will be allowed, but the actual measured and/or computed length, area, solid contents, number and weight only shall be considered, unless otherwise specifically provided.

**5.02 ESTIMATED QUANTITIES.** This agreement, including the specifications, plans and estimate, is intended to show clearly all work to be done and material to be furnished hereunder. where the estimated quantities are shown for the various classes of work to be done and material to be furnished under this contract, they are approximate and are to be used only as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It is understood and agreed that the actual amount of work to be done and material to be furnished under this contract may differ somewhat from these estimates, and that where the basis for payment under this contract is the unit price method, payment shall be for the actual amount of such work done and the material furnished.

Where payment is based on the unit price method, the CONTRACTOR agrees that he will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this contract and the estimated quantities contemplated and contained in the proposal; provided, however, that in case the actual quantity of any major item should become as much as 20% more than, or 20% less than the estimated or contemplated quantity for such items, than either party to this Agreement, upon demand, shall be entitled to a revised consideration upon the portion of the work above or below 20% of the estimated quantity.

A "Major Item" shall be construed to be any individual bid item incurred in the proposal that has a total cost equal to or greater than five(5) percent of the total contract cost, computed on the basis of the proposal quantities and the contract unit prices.

Any revised consideration is to be determined by agreement between the parties, otherwise by the terms of this Agreement, as provided under "Extra Work".

**5.03 PRICE OF WORK.** In consideration of the furnishing of all the necessary labor, equipment and material, and the completion of all work by the CONTRACTOR, and on the completion of all work and of the delivery of all material embraced in this Contract in full conformity with the specifications and stipulations herein contained, the OWNER agrees to pay the CONTRACTOR the prices set forth in the Proposal hereto attached, which has been made a part of this contract. The CONTRACTOR hereby agrees to receive such prices in full for furnishing all material and all labor required for the aforesaid work, also for all expense incurred by him, and for well and truly performing the same and the whole thereof in the manner and according to this Agreement.

**5.04 PARTIAL PAYMENTS.** On or before the 10th day of each month, the CONTRACTOR shall prepare and submit to the ENGINEER a statement showing as completely as practicable the total value of the work done by the CONTRACTOR up to and including the last day of the preceding month; said statement shall also include the value of all sound materials delivered on the site of the work that are to be fabricated into the work. The ENGINEER shall review said statement and recommend to the OWNER approval, modification or rejection of same.

Within 30 consecutive calendar days after approval of the aforesaid statement by the OWNER, the OWNER shall pay the CONTRACTOR the total amount of the approved statement, less 10 percent of the amount thereof, which 10 percent shall be retained until final payment, and further less all previous payments and all further sums that may be retained by the OWNER under the terms of this Agreement. It is understood, however, that in case the whole work be near to completion and some unexpected and unusual delay occurs due to no fault or

neglect on the part of the CONTRACTOR, the OWNER may, upon written recommendation of the ENGINEER, pay a reasonable and equitable portion of the retained percentage to the CONTRACTOR; or the CONTRACTOR at the OWNER'S option, may be relieved of the obligation to fully complete the work and, thereupon, the CONTRACTOR shall receive payment of the balance due him under the contract subject only to the conditions stated under "Final Payment".

**5.05 USE OF COMPLETED PORTIONS.** The OWNER shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions may not have expired but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the work, the CONTRACTOR shall be entitled to such extra compensation, or extension of time, or both, as the ENGINEER may determine.

The CONTRACTOR shall notify the ENGINEER when, in the CONTRACTOR'S opinion, the contract is "substantially completed" and when so notifying the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER in writing a detailed list of unfinished work. The ENGINEER will review the CONTRACTOR'S list of unfinished work and will add thereto such items as the CONTRACTOR has failed to include. The "substantial completion" of the structure or facility shall not excuse the CONTRACTOR from performing all of the work undertaken, whether of a minor or major nature, and thereby completing the structure or facility in accordance with the Contract Documents.

**5.06 FINAL COMPLETION AND ACCEPTANCE.** Within ten(10) days after the CONTRACTOR has given the ENGINEER written notice that the work has been completed, or substantially completed, the ENGINEER and the OWNER shall inspect the work and within said time, if the work is found to be completed or substantially completed in accordance with the Contract Documents, the ENGINEER shall issue to the OWNER and the CONTRACTOR his Certificate of Completion, and thereupon shall place the project on the next available City Council agenda for final acceptance and approval of final payment.

**5.07 FINAL PAYMENT.** Upon the issuance of the Certificate of Completion, the ENGINEER shall proceed to make final measurements and prepare final statement of the value of all work performed and materials furnished under the terms of the Agreement and shall certify same to the OWNER, who shall pay to the CONTRACTOR, within 30 consecutive calendar days after formal acceptance of the completed project by the City Council, the balance due the CONTRACTOR under the terms of this Agreement, provided he has fully performed his contractual obligations under the terms of this contract; and said payment shall be come due in any event upon said performance by the CONTRACTOR. Neither the Certificate of Acceptance nor the final payment, nor any provision in the contract Documents, shall relieve the CONTRACTOR of the obligation for fulfillment of any warranty which may be required.

**5.08 PAYMENTS WITHHELD.** The OWNER may, on account of subsequently discovered evidence, withhold or nullify the whole or part of any certificate to such extent as may be necessary to protect himself from loss on account of:

- (a) defective work not remedied
- (b) claims filed or reasonable evidence indicating probable filing of claims
- (c) failure of the CONTRACTOR to make payments properly to subcontractors or for material

- or labor
- (d) damage to another contractor
- (e) reasonable doubt that the work can be completed for the unpaid balance of the contract amount
- (f) reasonable indication that the work will not be completed within the contract time

When the above grounds are removed or the CONTRACTOR provides a Surety Bond satisfactory to the OWNER, which will protect the OWNER in the amount withheld, payment shall be made for amounts withheld because of them.

**5.09 DELAYED PAYMENTS.** Should the OWNER fail to make payment to the CONTRACTOR of the sum named in any partial or final statement, when payment is due, then the OWNER shall pay to the CONTRACTOR, in addition to the sum shown as due by such statement, interest thereon at the rate of six(6) percent per annum, unless otherwise specified, from date due as provided under "Partial Payments" and "Final Payments", until fully paid, which shall fully liquidate any injury to the CONTRACTOR growing out of such delay in payment.

## **6. EXTRA WORK AND CLAIMS**

**6.01 CHANGE ORDERS.** Without invalidating this Agreement, the OWNER may, at any time or from time to time, order additions, deletions or revisions to the work; such changes will be authorized by Change Order to be prepared by the ENGINEER for execution by the OWNER and the CONTRACTOR. The Change Order shall set forth the basis for any change in contract price, as hereinafter set forth for Extra Work, and any change in contract time which may result from the change.

In the event the CONTRACTOR shall refuse to execute a Change Order which has been prepared by the ENGINEER and executed by the OWNER, the ENGINEER may in writing instruct the CONTRACTOR to proceed with the work as set for the in the Change Order and the CONTRACTOR may make claim against the OWNER for Extra Work involved therein, as hereinafter provided.

**6.02 MINOR CHANGES.** The ENGINEER may authorize minor changes in the work not inconsistent with the overall intent of the Contract Documents and not involving an increase in Contract Price. If the CONTRACTOR believes that any minor change or alteration authorized by the ENGINEER involves Extra Work and entitles him to an increase in the Contract Price, the CONTRACTOR shall make written request to the ENGINEER for a written Field Order.

In such case, the CONTRACTOR by copy of his communication to the ENGINEER or otherwise in writing shall advise the OWNER of his request to the ENGINEER for a written Field Order and that the work involved may result in an increase in the Contract Price.

Any request by the CONTRACTOR for a change in Contract Price shall be made prior to beginning the work covered by the proposed change.

**6.03 EXTRA WORK.** It is agreed that the basis of compensation to the CONTRACTOR for work either added or deleted by a Change Order or for which a claim for Extra Work is made shall be determined by one or more of the following methods:

Method (A): by agreed unit prices; or

Method (B): by agreed lump sum; or

Method (C): if neither Method (A) nor Method (B) be agreed upon before the Extra Work is commenced, then the CONTRACTOR shall be paid the “actual field cost” of the work, plus fifteen (15) percent.

In the event said Extra Work be performed and paid for under Method (C), then the provisions of this paragraph shall apply and the “actual field cost” is hereby defined to include the cost to the CONTRACTOR of all workmen, such as foreman, timekeepers, mechanics and laborers, and materials, supplies, teams, trucks, rentals on machinery and equipment, for the time actually employed or used on such Extra Work, plus actual transportation charges necessarily incurred, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work, including Social Security, Old Age Benefits, and other payroll taxes, and, a rateable proportion of premiums on Performance, Payment, and Maintenance Bonds, Public Liability and Property Damage and Workmen’s Compensation, and all other insurance as may be required by any law or ordinance, or directed by the OWNER, or by them agreed to. The ENGINEER may direct the form in which accounts of the “actual field cost” shall be kept and the records of these accounts shall be made available to the ENGINEER. The ENGINEER or OWNER may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used; otherwise these matters shall be determined by the CONTRACTOR. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using 100 percent, unless otherwise specified, of the latest schedule of Equipment Ownership Expense adopted by the Associated General Contractors of America. Where practicable the terms and prices for the use of machinery and equipment shall be incorporated in the Written Extra Work Order. The fifteen (15%) percent of the “actual field cost” to be paid the CONTRACTOR shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the “actual field cost” as herein defined, save that where the CONTRACTOR’S Camp or Field Office must be maintained primarily on account of such Extra work; then the cost to maintain and operate the same shall be included in the “actual field cost”.

No claim for Extra work of any kind will be allowed unless ordered in writing by the ENGINEER. In case any orders or instructions, either oral or written, appear to the CONTRACTOR to involve Extra Work for which he should receive compensation or an adjustment in the construction time, he shall make written request to the ENGINEER for written order authorizing such Extra Work. Should a difference of opinion arise as to what does or does not constitute Extra Work, or as to the payment therefor, and the ENGINEER insists upon its performance, the CONTRACTOR shall proceed with the work after making written request for written order and shall keep an accurate account of the “actual field cost” thereof, as provided under Method (C).

**6.04 TIME OF FILING CLAIMS.** It is further agreed by both parties hereto that all questions of dispute or adjustment presented by the CONTRACTOR shall be in writing and filed with the ENGINEER within thirty (30) days after the ENGINEER has given any directions, order or instruction to which the CONTRACTOR desires to take exception. The ENGINEER shall reply within thirty (30) days to such written exceptions by the CONTRACTOR and render his final decision in writing. It is further agreed that final acceptance of the work by the

OWNER and the acceptance by the CONTRACTOR of the final payment shall be a bar to any claims by either party, except where noted otherwise in the Contract Documents. Contractor's failure to timely comply with the time limitations set out herein shall waive any entitlement to dispute or adjustment.

## **7. CONTRACTOR'S TIMELY PERFORMANCE**

**7.01 CONTRACTOR'S OBLIGATION TO TIMELY PERFORM.** In case the CONTRACTOR should abandon or otherwise fail or refuse to commence, continue, or resume work within ten (10) days after written notification from the OWNER, or the ENGINEER, or if the CONTRACTOR fails to comply with the orders of the ENGINEER, when such orders are consistent with the Contract Documents, then, and in that case, where performance and payment bonds exist, the Sureties on these bonds shall be notified in writing and directed to complete the work, and a copy of said notice shall be delivered to the CONTRACTOR.

**7.02 OWNER'S IMMEDIATE REMEDY.** After receiving said notice of failure to perform the CONTRACTOR shall not remove from the work any machinery, equipment, tools, materials, or supplies then on the job, but the same, together with any materials and equipment under contract for the work, may be held for use on the work by the OWNER or the Surety on the performance bond, or another contractor in completion of the work; and the CONTRACTOR shall not receive any rental or credit therefor (except when used in connection with extra work, where credit shall be allowed as provided for under Section 6, Extra Work and Claims), it being understood that the use of such equipment and materials will ultimately reduce the cost to complete the work and be reflected in the final settlement.

**7.03 OWNER'S ADDITIONAL REMEDIES.** Where there is no performance bond provided or in case the Surety should fail to commence compliance with the notice of failure to perform hereinbefore provided for, within ten (10) days after service of such notice, then the OWNER may provide for completion of the work in either of the following elective manners:

**7.03.1** The OWNER may thereupon employ such force of men and use such machinery, equipment, tools, materials and supplies as said OWNER may deem necessary to complete the work and charge the expense of such labor, machinery, equipment, tools, materials and supplies to said CONTRACTOR, and expense so charged shall be deducted and paid by the OWNER out of such moneys as may be due, or that may thereafter at any time become due to the CONTRACTOR under and by virtue of this Agreement. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the CONTRACTOR, then said CONTRACTOR shall receive the difference. In case such expense is greater than the sum which would have been payable under this contract, if the same had been completed by said CONTRACTOR, then the CONTRACTOR and/or his Surety shall pay the amount of such excess to the OWNER; or

**7.03.2** In the instance of CONTRACTOR'S failure to perform in the commencement of the contract, and if bids remain outstanding and enforceable from the original bid process, OWNER may award the contract to the next qualified low bidder who will accept the contract. If all bids have expired or no qualified bidder will accept the work, then the OWNER under sealed bids, after five (5) days notice published one or more times in a newspaper having general circulation in the county of the location of the work, may let the contract for the completion of the work under substantially the same terms and conditions which are provided in this contract. In case any increase in cost to the OWNER under the new contract as compared to what would have

been the cost under this contract, such increase shall be charged to the CONTRACTOR and the Surety shall be and remain bound therefor. However, should the cost to complete any such new contract prove to be less than what would have been the cost to compete under this contract, the CONTRACTOR and/or his Surety shall be credited therewith.

When the work has been substantially completed, the CONTRACTOR and his Surety shall be so notified and Certificates of Completion and Acceptance, as provided in Paragraph 5.06 hereinabove, shall be issued. A complete itemized statement of the contract accounts, certified to by the ENGINEER as being correct, shall then be prepared and delivered to the CONTRACTOR and his Surety, whereupon the CONTRACTOR and/or his Surety, or the OWNER as the case may be, shall pay the balance due as reflected by said statement, within fifteen (15) days after the date of such Certificate of Completion.

In the event the statement of accounts shows that the cost to complete the work is less than that which would have been the cost to the OWNER had the work been completed by the CONTRACTOR under the terms of this contract; or when the CONTRACTOR and/or his Surety shall pay the balance shown to be due by them to the OWNER, then all machinery, equipment, tools, materials, or supplies left on the site of the work shall be turned over to the CONTRACTOR and/or his Surety. Should the cost to complete the work exceed the contract price, and the CONTRACTOR and/or his Surety fail to pay the amount due the OWNER within the time designated hereinabove, and there remains any machinery, equipment, tools, materials, or supplies on the site of the work, notice thereof, together with an itemized list of such equipment and materials, shall be mailed to the CONTRACTOR and his Surety at the respective addresses designated in this contract, provided, however, that actual written notice given in any manner will satisfy this condition. After mailing, or other giving of such notice, such property shall be held at ordinary care to protect such property. After fifteen (15) days from the date of said notice the OWNER may sell such machinery, equipment, tools, materials, or supplies and apply the net sum derived from such sale to the credit of the CONTRACTOR and his Surety. Such sale may be made at either public or private sale, with or without notice, as the OWNER may elect. The OWNER shall release any machinery, equipment, tools, materials, or supplies, which remain on the work, and belong to persons other than the CONTRACTOR or his Surety, to their proper owners. The books on all operations provided herein shall be open to the CONTRACTOR and his Surety.

**7.04** The remedies set herein for CONTRACTOR'S failure to timely perform shall not be exclusive; OWNER shall be entitled to exercise any and all other remedies under this contract or available to OWNER at law or in equity, in the event of CONTRACTOR'S failure to timely perform.

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## **SPECIAL CONDITIONS OF AGREEMENT**

- SP-1. **LINES AND GRADES.** The construction plans include a horizontal control line (baseline) and vertical control points (bench marks). These have been established in the field and will be re-established or shown to the Contractor prior to commencing construction. After construction has started, the Contractor shall be responsible for protecting and preserving these controls. From these controls, the Contractor shall stake all alignments for the work and will be responsible for all horizontal and vertical construction staking.
- SP-2. **SUPERINTENDENCE.** The Contractor or his appointed Superintendent(s) shall provide proper superintendence for this entire project. Correspondence, questions concerning the project, interpretations and instructions shall be to or through the Contractor or the Superintendent. The Engineer will not in any manner supervise the Contractor's workmen or subcontractors. The Contractor or his Superintendent shall be on the job site whenever work is in progress.
- SP-3. **PROJECT MAINTENANCE.** The project area shall be maintained by the Contractor in a neat, passable condition. Vehicular access shall be maintained to every house and adjacent property. The Contractor shall provide a crew to maintain streets and driveways during holidays and weekends for the period of this contract.
- SP-4. **EXTENSION OF TIME.** The Contractor may make written request for an extension of time because of acts of God, acts of war, strikes, or unavailability of materials because of failure of the manufacturer or transporter. The Contractor shall support, by written evidence, any claim for a time extension because of any delay in receipt of material. An extension of time will not be granted for normal material delivery times, or failure of the Contractor to act properly toward the timely completion of the project.
- Upon written request, additional contract time will be granted only for the number of days that exceed the National Climatic Data Center's historical average number of days of rainfall of 0.1". Rain days shall be defined as a day with 0.1" or more of measured rainfall, as measured at the Gregg County Airport.
- SP-5. **INSURANCE.** The Contractor shall not commence work under this contract until he has obtained at his expense all insurance required under this section of the Special Provisions and by the Contract Documents and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on any subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Such insurance shall remain in full force and effect on all phases of the work, whether or not the work is occupied or utilized by the Owner, until all work under the Contract is completed and has been accepted by the Owner.

Nothing contained in the insurance requirements shall be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from his operations under the Contract.

Any insurance bearing an adequacy of performance will be maintained after completion of the project for the full guarantee period.

The Contractor shall obtain and maintain for the full period of the Contract the following types of insurance in the form, minimum limits and amounts herein specified or as may be otherwise required in the Contract Documents. The Contractor shall automatically renew any policy which expires during the performance of his Contract and notify the Owner and Engineer of such a renewal prior to expiration date.

A. Workmen's Compensation including Occupational Disease, and Employer's Liability Insurance.

Definitions:

*Certificate of coverage ("certificate")* - a copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

*Duration of the project* - includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

*Persons providing services on the project ("subcontractor" in 406.096)* - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

The contractor shall provide coverage, on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all

employees of the contractor providing services on the project, for the duration of the project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

1. a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
2. no later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

The contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

1. provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;

2. provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;
3. provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
4. obtain from each other person with whom it contracts, and provide to the contractor:
  - (a) a certificate of coverage, prior to the other person beginning work on the project, and
  - (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
5. retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
6. notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
7. contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificate of coverage to be provided to the person for whom they are providing services.

By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles the governmental entity to declare the

contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

B. Public Liability Insurance. (Note "Indemnity" clause hereinafter). Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained for the period of the Contract full Comprehensive General Liability Insurance coverage. This coverage shall protect the Contractor; the Owner; the Engineer, its architects and engineers; and each of their officers, agents and employees from claims for damages for bodily or personal injury, sickness or disease, including death, and from claims for damages to property, which may arise directly or indirectly out of, or in connection with the performance of work under this Contract by the Contractor, by any of his subcontractors, or by anyone directly or indirectly employed of either of them, or under the control of either of them, and the minimum amount of such insurance shall be as follows unless higher minimum amounts are otherwise required in the Contract Documents:

Public Liability Insurance in an amount not less than One Million Dollars (\$1,000,000) for damages arising out of bodily or personal injury, sickness or disease, or death of one person and subject to the same limit for each person in an amount not less than One Million Dollars (\$1,000,000) in any one occurrence; and property damage in an amount not less than One Million Dollars (\$1,000,000) for all single combined damages arising out of injury to or destruction of property of others in any one occurrence with an aggregate limit in the same amount.

The Property Damage portion of this coverage shall include explosion, collapse and underground exposure coverage. In addition, where Completed Operation Insurance coverage is applicable, such coverage will be maintained after completion and acceptance of the project for the full guarantee period.

C. Automobile Liability Insurance: Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained Automobile Liability Insurance coverage on all self-propelled vehicles designed for travel on public roads used in connection with the Contract, whether owned, non-owned, or hired. The liability limits shall not be less than Two Hundred Fifty Thousand Dollars (\$250,000) for injury or death of one person and in an amount not less than Five Hundred Thousand Dollars (\$500,000) in any one occurrence; and Property Damage limits of not less than One Hundred Thousand Dollars (\$100,000) in any one occurrence.

D. Contractual Liability Coverage: Each and every policy for Liability Insurance carried by each Contractor and Subcontractor will include a "Contractual Liability Coverage" endorsement sufficiently broad to insure the provision titled "Indemnity" hereinafter set forth.

E. Indemnity: The Contractor shall defend, indemnify and hold harmless the Owner; the Engineer, its Engineers; and each of their officers, agents, servants, and employees; from any and all suits, actions, claims, losses or damage of any character and from all expenses incidental to the defense of such suits, actions or claims, based upon or arising out of or alleged to be based upon or arising out of (1) any injury, disease, sickness or death of any person or persons, (2) any damages to any property including in part loss of use thereof, caused by any act or omission of the Contractor, of any subcontractor of the Contractor, or by their officers, agents, servants, employees, or anyone else under the Contractor's direction and control, and arising out of, occurring in connection with, resulting from, or caused by the performance or failure of performance of any work or services called for by the Contract or from conditions created by the performance or non-performance of said work or services, but not including the sole negligence of any party herein indemnified.

F. Builders' Risk "All-Risk" Insurance: In addition to such Fire and Extended Insurance coverage which the Contractor or his subcontractors elect to carry for their own protection, the Contractor, before commencement of the work, shall effect and maintain for the life of his Contract Builders' Risk "All Risk" completed Value Insurance coverage upon the full insurable value of all portions of the project which is the subject of this Contract and subject to a loss for which Builders' Risk "All-Risk" Insurance coverage gives protection, and shall include completed work and work in progress. This coverage shall be with an insurance company or companies acceptable to the Owner.

Such insurance shall include as Additional Named Insured: The Owner; the Engineer, its architects and engineers; and any of their officers, agents, and employees; and any other persons with an insurable interest designated by the Owner as an Additional Named Insured.

Duplicate originals of the policy of insurance required herein shall be furnished to the Engineer as provided under "Evidence of Insurance Coverage" hereinafter.

G. Evidence of Liability & Builders' Risk Insurance Coverage: Before commencement of any work, the Contractor shall submit written evidence that he and all his subcontractors have obtained the minimum insurance required by the Contract Documents. Such written evidence shall be in the form of a Certificate of Insurance executed by the Contractor's insurance carrier showing such policies in force for the specified period or by furnishing a copy of the actual policy or policies. Each policy or certificate will bear an endorsement or statement waiving right of cancellation or reduction in coverage without ten (10) days notice in writing to be delivered by registered mail to the Owner.

The Contractor shall furnish duplicate originals of Builders' Risk "All-Risk" Completed Value Insurance coverage to the Engineer, one copy of which shall be for the Owner and one copy for the Engineer.

- SP-6. **WATER FOR CONSTRUCTION.** The Owner will furnish a fire hydrant meter for construction water on this project. The Contractor will be responsible for paying an \$800 meter deposit before the meter will be set. In addition, the Contractor will be responsible for hiring a licensed plumber to install the backflow prevention device on the fire hydrant meter. The Contractor shall provide for all labor and equipment necessary. Such water shall be taken from the system at times, locations, and under conditions approved by the Engineer. Contractor shall notify Owner at least one week in advance of when construction water will be needed.
- SP-7. **ELECTRICITY.** The Contractor shall make his own arrangement for electricity.
- SP-8. **EXPLOSIVES.** The use of explosives will not be permitted.
- SP-9. **SANITARY REQUIREMENTS.** The operations of the Contractor shall be in full conformance with all of the rules and regulations of boards and bodies having jurisdiction with respect to sanitation. The Contractor shall supply safe and sufficient drinking water to all of his employees, shall obey and enforce all sanitary regulations and orders, and shall take precaution against the spread of infectious diseases. Acceptable, portable, chemical-type toilets shall be provided and maintained by the Contractor.
- SP-10. **DISPOSAL OF SURPLUS MATERIALS.** All surplus materials not included or incorporated in the project shall be removed from the site to the satisfaction of the Engineer.
- SP-11. **SIGNS, BARRICADES, AND LIGHTING.** The Contractor shall provide and erect construction signing, barricades and lighting to protect the public in connection with the work, all in accordance with the latest published provisions of the Texas Manual of Uniform Traffic Control Devices and as approved by the Engineer. The construction drawings indicate only the general signing required and do not detail the requirements for protection in connection with trenching and other construction operations.
- Existing street signs, traffic signs and all other signs within the project area shall be protected, maintained and replaced if damaged or stolen; all by the Contractor as approved by the Engineer.
- SP-12. **MATERIALS AND WORKMANSHIP.** All materials incorporated into this project shall be new and of first quality except as specifically provided for in the technical specifications. The workmanship shall be of the highest level as approved by the Engineer.

- SP-13. **EXISTING FACILITIES.** Whether shown on the plans or not, the Contractor shall be completely responsible for the protection or replacement of all facilities within the project area and in connection with the work.
- SP-14. **GUARANTEE.** As a part of this project, the Contractor shall guarantee all materials and workmanship and shall repair or remove and replace any defective condition as determined by the Engineer. Such guarantee shall be effective for a period of one year from the date of written acceptance by the Owner or date of final payment whichever is first. The maintenance bond shall be in full effect throughout the warranty period.
- SP-15. **STATE SALES TAX.** The Contractor's attention is directed to paragraph No. 3 of Ruling No. 9 by obtaining the necessary permit or permits from the State Comptroller allowing the purchase of materials for incorporation in this project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase. Such bidders must submit segregated prices for the total cost of materials and total cost of services, and the successful bidder must require his sub-contractors to obtain such permits and to sign written sub-contracts in which the prices are segregated for the total cost of materials and the total cost of services. Total materials cost should not include materials which are used or consumed in performing the work, but do not become a part of the completed installation.

After the bid opening and prior to execution of contract, the low bidder will be required to provide a separation of materials costs and labor costs for the amounts of the base bid and any alternatives. The following form shall be used to provide this information. This form shall be submitted in six(6) copies with the executed contract and such statement will become a part of the contract:

**STATEMENT OF MATERIALS AND SERVICES**

City of Longview

Project Name: \_\_\_\_\_  
 \_\_\_\_\_

Total Materials Cost: \$ \_\_\_\_\_  
 Total Service Cost: \$ \_\_\_\_\_

TOTAL CONTRACT PRICE: \$ \_\_\_\_\_

Note: The total materials cost plus the total services cost must equal the amount shown of the total contract price.

- SP-16. **CLEANUP.** The entire project site shall be left in as good or better condition as the condition at the time construction is started, all as approved by the Engineer. All cleanup shall be completed within the time specified for the project construction and

liquidated damages will be applied to cleanup time in the event such is performed after the contract time has expired.

- SP-17. **CERTIFICATE OF INCORPORATION**. In the event the contractor is a corporation, the contractor shall furnish a certificate issued by the Secretary of the State of Texas dated not more than thirty days prior to commencement of construction evidencing that the contractor is a corporation duly incorporated under the laws of the State of Texas and currently in good standing, or in the case of a corporation not incorporated under the laws of the State of Texas, the certificate shall evidence that such corporation currently holds a permit to do business in the State of Texas and it is in good standing. Such corporate contractor shall at all times pay all franchise taxes and other taxes and assessments levied against it by the State of Texas and at all times maintain its corporate status and good standing according to the laws of the State of Texas.
- SP-18. **ALTERNATE MATERIALS AND METHODS**. Consistent with the intent and character of this project, the Contractor may request from the Engineer the substitution of materials or methods of construction which he believes will give equal results. The request shall be in writing and shall contain detailed information. The Engineer will consider such requests and shall give his answer in writing. The Engineer's judgement will be final and no reason for denial will be required except as may be offered by the Engineer. The Engineer may require additional information on which to make a judgement; in which case it shall be the entire responsibility of the Contractor to provide such information.
- SP-19. **EXPECTED EARNINGS SCHEDULE**. At the pre-construction conference for this project, the successful bidder shall submit to the City Engineer an "Expected Earnings Schedule". This table or chart shall show the amount of payment the contractor expects to receive from the City on this project each month until the project is completed. The table can be handwritten or typed. Though the contractor shall make his best effort in estimating these payments accurately, the schedule shall be used for estimating purposes only and shall not bind the City nor the Contractor to the listed payments. Payments, as usual, will be made upon actual work performed less the appropriate retainage.
- SP-20. **PERFORMANCE, PAYMENT, AND MAINTENANCE BONDS**. Surplus lines carriers under Article 1.14-2 of the Insurance Code are not eligible to act as sureties on performance, payment, and maintenance bonds.
- SP-21. **RETAINAGE**. Retainage is that part of the contract payment withheld by the City to secure performance of the contract.

Retainage shall be withheld at the following rates:

- A. For any contract where the total contract price estimate at the time of execution of the contract is less than \$400,000 retainage shall be 10%.

B. For any contract where the total contract price estimate at the time of execution of the contract is greater than or equal to \$400,000 retainage shall be 5%.

- SP-22. **MATERIAL ON HAND.** Unless otherwise specified in a writing signed by the Owner prior to the bid opening for this project, the Owner will pay the Contractor for materials on hand for this project, subject to the provisions of this Contract. Such payment will be made only for materials stored on-site in a manner acceptable to the Owner. At a minimum, materials must be stored in a manner that prevents damage, theft, and vandalism. Additionally, payment will be made only for materials for which the Contractor has supplied invoices to the Engineer that substantiate the amount paid for said materials.
- SP-23. **INSPECTION.** Contractor will be allowed to work prior to 8:00 a.m. and after 4:30 p.m. on weekdays, and may also elect to work on Saturdays. The City will provide an inspector at these times as necessary. The Contractor, however, will be required to reimburse the City of Longview for the actual hours worked by the inspector outside of the regular 8:00 a.m. to 4:30 p.m. Monday through Friday hours. Such reimbursement will be made at a rate of \$25 per hour.
- SP-24. **AS-BUILT DRAWINGS.** The Contractor will provide the City, prior to final payment, one set of construction drawings red-lined to show any changes in actual construction.
- SP-25. **FIREARMS PROHIBITED.** Contractor agrees that Contractor, Contractor's officers, employees, agents, and representatives, shall not carry any firearms, including without limitation concealed handguns, while in the performance of this Contract and on City premises (including City rights-of-way, utility easements, or drainage easements) or when meeting with City officers or employees regarding this Contract. Contractor agrees that failure by Contractor to comply with this requirement shall constitute a substantial breach of this Contract, entitling City to all remedies under the law or this Contract for such breach, including without limitation the City's right to terminate this Contract for substantial nonperformance.
- SP-26. **PREVAILING WAGE RATES.** Contractor agrees to abide by the requirements of Texas Government Code Chapter 2258, entitled "Prevailing Wage Rates," as applicable. Contractor understands that a contractor or subcontractor subject to the requirements of that Chapter must pay the prevailing wage rates as set forth in this Contract. Any contractor or subcontractor who violates this requirement may be subject to penalties as provided in Chapter 2258, including but not limited to a penalty of \$60 for each worker employed for each calendar day or part of the day that the work is paid less than the wage rates stipulated in this Contract."
- SP-27. **ALLOWANCE FOR MISCELLANEOUS EXTRA WORK:** A discretionary allowance has been established in the Bid Proposal for extra work for which a method of payment, such as individual bid items, has not been established. This allowance is

not intended to be used to procure payment for items specifically named as subsidiary to other bid items within the contract documents such as the subsurface conditions described in the General Provisions or Special Conditions.

Prior to initiating any item of extra work under the allowance bid item the Owner, Engineer, and Contractor shall agree as to the scope of extra work to be performed and the amount of payment to be made for the particular item of extra work under consideration. Expenditure of the allowance funds is at the sole discretion of the Owner. The allowance may be used in full or in part, as the Owner deems necessary. If no extra work is identified, and approved by the Owner, the allowance funds will not be expended.

# LONGVIEW MULTIMODAL TRANSPORTATION CENTER

## Technical Specifications

Project Owner:



Prepared By:



**Johnson & Pace Incorporated**

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PROJECT: Longview Multimodal Transportation Center

PROJECT ENGINEER: TRAVIS CRAFTON, P.E.

## SECTION 02 4116 - STRUCTURE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of buildings and site improvements.
- 2. Abandoning in-place and Removing below-grade construction.
- 3. Disconnecting, capping or sealing, abandoning in-place and removing site utilities.

- B. Related Sections:

- 1. Division 01 Section "Summary" for use of the premises and phasing requirements.
- 2. Division 01 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
- 3. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings, structures, and site improvements.
- 4. Division 23 Sections for demolishing or relocating site mechanical items.
- 5. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
- 6. Division 33 Section "Common Work Results for Utilities" for shutting off, disconnecting, removing, and sealing or capping utilities.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 SUBMITTALS

- A. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before the Work begins.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Owner assumes no responsibility for buildings and structures to be demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 31 Section "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

STRUCTURE DEMOLITION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Division 01 Section "Photographic Documentation."
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
- C. Salvaged Items: Comply with the following:
  - 1. Clean salvaged items of dirt and demolition debris.

### 3.3 PROTECTION

- A. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
    - a. Provide at least 72 hours notice to occupants of affected buildings if shutdown of service is required during changeover.
- B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities And Controls."
  - 1. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
  - 2. Maintain fire watch during and for at least 24 hours after flame cutting operations.
  - 3. Maintain adequate ventilation when using cutting torches.
  - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Explosives: Use of explosives is not permitted.

### 3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be removed and salvaged are indicated on Drawings.
- D. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.
- E. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.
  - 1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 24 inches below grade.
- F. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
- G. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within **5 feet** outside footprint indicated for new construction. Abandon utilities outside this area.
  - 1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."
  - 2. Piping: Disconnect piping at unions, flanges, valves, or fittings.
  - 3. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

### 3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA approved landfill acceptable to authorities having jurisdiction. See Division 01 Section "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
  - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 4116

## SECTION 31 1000 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. Section Includes:

- 1. Protecting existing vegetation to remain.

B. Related Sections:

- 1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion-and sedimentation-control measures.
- 2. Division 01 Section "Execution" for field engineering and surveying.
- 3. Division 01 Section "Construction Waste Management and Disposal".
- 4. Division 02 Section "Structure Demolition" for demolition of buildings, structures, and site improvements.
- 5. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings or structures.

#### 1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on the Drawings.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify the utility locator service, (Texas One Call System, Digg Tess, etc.) for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- D. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

SITE CLEARING

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag and Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection" and also as indicated on the Drawings.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.3 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 1000

## SECTION 31 2000 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

- B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" and "Photographic Documentation" for recording pre-excavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Division 14 Section "Hydraulic Elevators" for excavating well hole to accommodate elevator-cylinder assembly.
5. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
6. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
7. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
8. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
9. Division 31 Section "Drilled Concrete Piers and Shafts" for excavation of shafts and disposal of surplus excavated material.
10. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
11. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
12. Division 33 Section "Subdrainage" for drainage of foundations, slabs-on-grade, walls, and landscaped areas.

#### 1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Division 01 Section "Unit Prices."

- B. Quantity allowances for earth moving are included in Division 01 Section "Allowances."

#### 1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
  2. Geofilm.
  3. Warning tapes.

- B. Samples for Verification: For the following products, in sizes indicated below:
  - 1. Geotextile: 12 by 12 inches .
  - 2. Warning Tape: 12 inches long; of each color.
- C. Qualification Data: For qualified testing agency.
- D. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
  - 1. Classification according to ASTM D 2487.
  - 2. Laboratory compaction curve according to ASTM D 698 or ASTM D 1557. Refer to Drawings or Geotechnical Report for compaction specification.
- E. Seismic survey report from seismic survey agency.

#### 1.6 QUALITY ASSURANCE

- A. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
  - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
  - 2. Seismographic monitoring during blasting operations.
- B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

#### 1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify the utility locator service, (Texas One Call System, Digg Tess, etc.) for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," Division 31 Section "Site Clearing," the Storm Water Pollution Prevention Plan (SWPPP), and the drawings are in place.
- E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" and the Drawings are in place.

- F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Foot traffic.
  4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, SM, and some CL soils according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. Liquid Limit: 35 or Less.
  2. Plasticity Index: Between 7 and 18.
- C. Unsatisfactory Soils: Materials which do not comply with the requirements for Satisfactory Material are unsatisfactory.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
  2. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

## 2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Grab Tensile Strength: 157 lbf ; ASTM D 4632.
  - 3. Sewn Seam Strength: 142 lbf ; ASTM D 4632.
  - 4. Tear Strength: 56 lbf ; ASTM D 4533.
  - 5. Puncture Strength: 56 lbf ; ASTM D 4833.
  - 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  - 7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
  - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Grab Tensile Strength: 247 lbf ; ASTM D 4632.
  - 3. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
  - 4. Tear Strength: 90 lbf ; ASTM D 4533.
  - 5. Puncture Strength: 90 lbf ; ASTM D 4833.
  - 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  - 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

## 2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.
  - 4. Blue: Water systems.
  - 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core

encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### 3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs-on-grade.
    - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

### 3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
  - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit or as indicated on Drawings.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
  - 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
  - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 25 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.

4. Under building slabs, use engineered fill.
  5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

### 3.13 GEOFOAM FILL

- A. Place a leveling course of sand, 2 inches thick, over subgrade. Finish leveling course to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
  1. Place leveling course on subgrades free of mud, frost, snow, or ice.
- B. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
- C. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.
- D. Cover geofoam with subdrainage geotextile before placing overlying soil materials.

### 3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
  1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
  3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  4. For utility trenches, compact each layer of initial and final backfill soil material at 92 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1 inch.
  - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
  - 2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
  - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place base course material over subbase course under hot-mix asphalt pavement.
  - 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
  - 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.

5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  6. Compact subbase course at optimum to +/- 3% optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
  7. Compact base course at optimum to +/- 3% optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place drainage course 6 inches or less in compacted thickness in a single layer.
  3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.20 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  2. Determine that fill material and maximum lift thickness comply with requirements.
  3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 2000

## SECTION 31 2500 - EROSION AND SEDIMENTATION CONTROL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes
  - 1. Installation of temporary and permanent erosion and sedimentation control systems.
  - 2. Installation of temporary and permanent slope protection systems.
  - 3. Storm Water Pollution Prevention Plan. (SWPPP)
  
- B. Related Sections
  - 1. Section 02 4116 – Structure Demolition
  - 2. Section 31 1000 - Site Clearing
  - 3. Section 31 2000 – Earthwork Moving
  - 4. Section 33 4100 – Storm Utility Drainage Piping
  - 5. Section 32 9200 – Turf and Grasses
  - 6. Storm Water Pollution Prevention Plan
  - 7. Construction Drawings (“Site Maps”)

#### 1.2 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent properties, any identified endangered or threatened species or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Seed, sod, and ground covers for the establishment of vegetation in accordance with Section 32 9200.
- B. Sediment control devices as specified on the Construction Drawings.
- C. Rolled erosion control products according to Erosion Control Technology Council (ECTC) standard specifications.
- D. Temporary mulches such as loose straw, wood cellulose, or agricultural silage.
- E. Rip-Rap as specified on the Drawings.
- F. Temporary and permanent outfall structures as specified on the Drawings.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Review the drawings and Storm Water Pollution Prevention Plan.
- B. Revise SWPPP as necessary to address potential pollution from site identified after issuance of the SWPPP at no additional cost to the owner.

3.2 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION  
IMPLEMENTATION

- A. Place erosion and sediment control systems in accordance with the drawings and Storm Water Pollution Prevention Plan or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.
- B. Deficiencies or changes on the drawings or Storm Water Pollution Prevention Plan shall be corrected or implemented as site conditions change. Changes during construction shall be noted in the Storm Water Pollution Prevention Plan and posted on the drawings (Site Map).
- C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.
- D. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional work ordered by Owner or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to the Owner.
- E. Contractor shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.
- F. Permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.
- G. Unless required within a shorter timeframe by the applicable General Permit for Storm Water Discharges Associated with Construction Activity, slopes that erode easily or that will not be graded for a period of 14 days or more shall be temporarily stabilized as work progresses with vegetation or other acceptable means in accordance with Section 32 9300 unless otherwise specified in the Contract Documents. In the event it is not practical to seed areas, slopes must be stabilized with mulch and tackifier, bonded fiber matrix, netting, blankets or other means to reduce the erosive potential of the area.

END OF SECTION

## SECTION 31 3200 - SOIL STABILIZATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

#### 1.2 SECTION INCLUDES

- A. Excavation, treatment, and backfilling of subgrade for lime, cement, fly ash, or bridge lift stabilization.
- B. Geotextile Fabric and/or Geogrid for stabilization of subgrade.

#### 1.3 RELATED SECTIONS

- A. Section 31 2000 – Earth Moving

#### 1.4 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM)
  - 1. ASTM C150 - Portland Cement
  - 2. ASTM C 618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
  - 3. ASTM C 977 - Quicklime and Hydrated Lime for Soil Stabilization
  - 4. ASTM D 1633 - Compressive Strength of Molded Soil-Cement Cylinders
- B. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO M 216 - Lime for Soil Stabilization
- C. National Lime Association (NLA)
  - 1. NLA Bulletin 326 - Lime Stabilization Construction Manual

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees Fahrenheit.

#### 1.6 SUBMITTALS

- A. Submit 30-pound sample of each material to be used at the site in airtight containers to the Independent Testing Laboratory or submit gradation and certification of material that is to be used to the Independent Testing Laboratory for review.
- B. Submit name of each materials supplier and specific type and source of each material. Obtain approval of Owner prior to change in source.
- C. Submit mix design and materials mix ratio to Independent Testing Laboratory that will achieve specified requirements as indicated in the documents (or as specified by state and local agencies for soil stabilization if not stated in documents).
- D. If geogrids or geotextiles are to be used, design shall be submitted to Owner for approval.

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with state and local standards in conjunction with requirements specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Treatment Materials:

- 1. Hydrated Lime
- 2. Portland Cement: ASTM C150, Type I
- 3. Fly Ash: ASTM C977 or AASHTO M216

B. Aggregate

- 1. Coarse Aggregate:: Crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slag, or other types of suitable material meeting the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-5

- 2. Fine Aggregate: Sand – Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter meeting the following gradation requirements:

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-5

- C. Subsoil: Existing to be Reused.
- D. Bridge Lift Material: Surge stone, granular fill, or shot rock fill.

2.2 ACCESSORIES

- A. Curing Seal: Asphalt Emulsion Primer
- B. Geotextile Fabric for Stabilization: Provide one of the following:
  - 1. Mirafi 500X or 600X
  - 2. Phillips 66 Supac 6WS
  - 3. Dupont Typar 3401 and 3601
  - 4. Trevira S1114 and S1120
  - 5. Tensar SS-1 and SS-2
  - 6. Exxon GTF-200 or 350
  - 7. TerraTex HD and GS

- C. Geogrid for Stabilization: Provide one of the following
  - 1. Tensor TX 5
  - 2. Tensor BX 1200
  - 3. Mirafi BasXgrid 11
  - 4. Mirafi BasXgrid 12

### 2.3 EQUIPMENT

- A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Obtain approval from the Independent Testing Laboratory of mix design before proceeding with placement.
- B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.
- C. Proofroll subgrade to identify areas in need of stabilization.

### 3.2 EXCAVATION

- A. Excavate subsoil to depth sufficient to accommodate soil stabilization.
- B. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.
- C. Do not excavate within normal 45 degree bearing splay of any foundation.
- D. Notify Construction Manager of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.
- E. Correct areas over-excavated in accordance with Section 312000.
- F. Remove excess excavated material from site.

### 3.3 GEOTEXTILE FABRIC AND/OR GEOGRID

- A. Place geotextile fabric and/or geogrid over subsoil surface, lap edges and ends in accordance with manufacturer's recommendations in those areas that are shown on Construction Drawings or in those areas that need additional stabilization prior to placement of base course. Bridge lift sections may require the use of geotextile fabric and/or geogrid for stabilization prior to placement of fill.
- B. Place geotextile fabric and/or geogrid in accordance with manufacturer's recommendations.

### 3.4 SOIL TREATMENT AND BACKFILLING

- A. Lime Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with hydrated lime in accordance with state highway department specifications.

- B. Cement Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with portland cement in accordance with state highway department specifications.
- C. Fly Ash Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with fly ash in accordance with state highway department specifications.
- D. Bridge Lifts: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade by application of a bridge lift. Bridging over existing soils shall be acceptable only when approved in writing by the Owner. Place geotextile fabric or geogrid over existing soils to be bridged. The geotextile fabric or geogrid selected shall be appropriate for the bridge lift material being placed. Place bridge lift over geotextile fabric or geogrid. Surge stone and shot rock will be approved by the Owner's representative on a submittal basis. The Owner and the Owner's representative shall have sole discretion as to the acceptability of all submittals.
- E. Backfill and compaction of treated subsoil shall be in accordance with Sections 312000.
- F. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.
- G. Finish subgrade surface in accordance with Section 312000.
- H. Remove surplus mix materials from site.

### 3.5 CURING

- A. Immediately following compaction of mix, seal top surface with curing seal.
- B. Do not permit traffic for 72 hours after sealing top surface.

### 3.6 FIELD QUALITY CONTROL

- A. Unconfined compression tests on lime, fly ash, or cement treated mixture shall be conducted in accordance with ASTM D 1633. Three tests shall be conducted for each mix design tested. Samples shall be cured at a constant moisture content and temperature for 28 days. Scratch portion of the test shall be omitted.
- B. Field Density: Field in-place density shall be determined as specified in Section 312000. At least one field density test shall be performed for each 250 square yards (or fraction thereof) of each layer of base material.
- C. If tests indicate work does not meet specified requirements, remove work, replace and re-test.

END OF SECTION

## SECTION 31 5000 - EXCAVATION SUPPORT AND PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation and Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
  - 3. Division 31 Section "Dewatering" for dewatering system for excavations.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
  - 1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
  - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 4. Monitor vibrations, settlements, and movements.

#### 1.4 SUBMITTALS

- A. Shop Drawings: For excavation support and protection system.
- B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Qualification Data: For qualified Professional Land Surveyor or Professional Engineer.
- D. Other Informational Submittals:
  - 1. Photographs or Videotape: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.
  - a. Note locations and capping depth of wells and well points.

## 1.5 PROJECT CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.
  1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
  2. The geotechnical report is included elsewhere in the Project Manual.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
  1. Corners: Site-fabricated mechanical interlock.
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 4 inches.
- E. Shotcrete: Comply with Division 03 Section "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.
- F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- H. Tiebacks: Steel bars, ASTM A 722/A 722M.
- I. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

- A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

### 3.5 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
  2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
  3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 3.6 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
  2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
  3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 31 5000

SECTION 32 1313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
2. Division 32 Section "Decorative Concrete Paving" for stamped concrete other than detectable warnings.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
  1. Exposed Aggregate: 10-lb Sample of each mix.
  2. Preformed Traffic-Calming Devices: 6 inches long showing cross section; with fasteners.
- E. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

F. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

G. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

H. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

I. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

## 1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
  - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- C. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- H. Plain-Steel Wire: ASTM A 82/A 82M.
- I. Deformed-Steel Wire: ASTM A 496/A 496M.
- J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.
- K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.
- M. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- N. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780.

## 2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, white portland cement Type I. Supplement with the following:
  - a. Fly Ash: ASTM C 618, Class C or Class F.
  - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 1/2 to 3/4 inch nominal.

D. Water: Potable and complying with ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: As selected by Architect from manufacturer's full range.

2.4 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch .
- F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
  - 1. Color: As selected by Architect from manufacturer's full range.
- G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.7 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
  - 1. Color: As indicated on Drawings.
- B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
  - 1. Color: As indicated on Drawings.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than [three] [45] minutes.
  - 1. Color: As indicated on Drawings.
- D. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
  - 1. Color: As indicated on Drawings.
- E. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325, Type 1A.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi or as indicated on the Drawings.
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: Maximum of 5 inches for hand placed concrete, 1-1/4 to 3 inches for machine placed (slipform) concrete.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content of 4 to 6 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.
- G. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate.

- H. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F , reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete batches larger than 1 cu. yd. , increase mixing time by 15 seconds for each additional 1 cu. yd. .
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph .
  - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons .
  - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRST's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement 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.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. The maximum joint spacing shall be twice the concrete thickness (measured in inches) in feet. For example, on a 4-inch thick concrete slab, the maximum joint spacing shall be 8-feet, on a 5-inch thick slab, the maximum joint spacing shall be 10-feet, on a 6-inch thick slab, the maximum joint spacing shall be 12-feet, and so on up to a maximum spacing of 15-feet.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Keyed joints or keyway-section type forms are strictly prohibited on this project.
  - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
1. Extend joint fillers full width and depth of joint.
  2. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  3. Place top of joint filler 1/8" below finished concrete surface if joint sealant is not indicated.
  4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  5. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
    - a. Tolerance: Ensure that grooved joints are within 2 inches either way from centers of dowels.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    - a. Tolerance: Ensure that sawed joints are within 2 inches either way from centers of dowels.
  3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
  3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread 40 lb/100 sq. ft. of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
  2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
  3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.

4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

D. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft., unless greater amount is recommended by manufacturer to match paving color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
3. After final power floating, apply a hand-trowel finish followed by a broom finish.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

### 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- B. Comply with ACI 306.1 for cold-weather protection.

- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
  - a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 2 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

### 3.11 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
  2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.13 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

## SECTION 32 1373 - CONCRETE PAVING JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
- B. Related Sections:
  - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
  - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
  - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

#### 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint sealants.
  - 1. Use ASTM C 1087 or the manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit no fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

#### 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Qualification Data: For qualified Installer and testing agency.
- D. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.
- F. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

## 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

### 2.2 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

### 2.3 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

- D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place joint sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

#### 3.4 CLEANING

- A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

#### 3.5 PROTECTION

- A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 32 1373

## SECTION 32 1723 - PAVEMENT MARKINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Painting and marking of pavements, curbs, guard posts, and light pole bases.

#### 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Association of State Highway and Transportation (AASHTO):
  - 1. AASHTO M247 - Glass Beads Used in Traffic Paints
  - 2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints
- C. ASTM International (ASTM):
  - 1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.
- D. Federal Specifications (FS):
  - 1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
  - 2. FS TT-B-1325 - Beads (Glass Spheres) Retro-Reflective
  - 3. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne

#### 1.3 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

#### 1.4 QUALITY ASSURANCE

- A. Use trained and experienced personnel in applying the products and operating the equipment required for properly performed work.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.
- B. Waterborne Paint: Paints shall conform to FS TT-P-1952.
- C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacture's instructions before application for colors White, Yellow, Blue, and Red.
- D. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325, Type 1, Gradation A.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Sweep and clean surface to eliminate loose material and dust.
- B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive device shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.
- C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 APPLICATION

- A. Apply two coats of same color of paint as specified below, at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.
- B. Install pavement markings according to manufacturer's recommended procedures for the specified material.
- C. Following items shall be painted with colors noted below:
  - 1. Pedestrian Crosswalks: White
  - 2. Exterior Sidewalk Curbs, Light Pole Bases, and Guard posts: Yellow
  - 3. Fire Lanes: Red or per local code
  - 4. Lane Striping where separating traffic moving in opposite directions: Yellow
  - 5. Lane Striping where separating traffic moving in the same direction: White
  - 6. ADA Symbols: Blue or per local code
  - 7. ADA parking space markings as shown on the drawings.
  - 8. Parking Stall Striping: Yellow, unless otherwise noted on Construction Drawings
  - 9. Associate Parking Area: White, unless otherwise noted on Construction Drawings
- D. Apply glass beads at pedestrian crosswalk striping and at lane striping and arrows at driveways connecting to public streets. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.4 FIELD QUALITY CONTROL

- A. Responsibilities: Unless otherwise specified, the quality control tests and inspections specified below will be conducted by the Owner's Construction Testing Laboratory (CTL) at no cost to the Contractor in accordance with Section 01458. The Contractor shall perform additional testing or inspection as considered necessary by the Contractor for assurance of quality control. Field testing, frequency, and methods may vary as determined by and between the Owner and CTL.

- B. Inspection: After the paint has thoroughly dried, visually inspect the entire application and touch up as required to provide clean, straight lines and surfaces throughout.
- C. Testing: Testing of wet film thickness shall be performed a minimum of two times on each parking row (including striped islands) and pedestrian cross walks, and a minimum of one test on each lane/alignment striping. At least one test shall be performed after refilling paint striping machine, changing operators of striping machine, and changing paint types, brands, etc. This shall be performed in addition to the testing stated above. These tests shall be performed on each coat applied. Testing shall be performed in accordance with ASTM D4414.

### 3.5 CLEANING

- A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION

## SECTION 32 9200 - TURF AND GRASSES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Turf renovation.
5. Erosion-control material(s).
6. Grass paving.

B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
3. Division 32 Section "Porous Unit Paving" for concrete grid-type pavers shaped to provide open areas between units, planted with grass or other plants.
4. Division 32 Section "Planting Irrigation" for turf irrigation.
5. Division 32 Section "Plants" for border edgings.
6. Division 33 Section "Subdrainage" for subsurface drainage.

#### 1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

- G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- H. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Material Test Reports: For standardized ASTM D 5268 topsoil, existing native surface topsoil, existing in-place surface soil, and imported or manufactured topsoil.

#### 1.5 QUALITY ASSURANCE

- A. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
  - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
  - 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
  - 3. Report suitability of tested soil for turf growth.
    - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
  - 1. Seeded Turf: 60 days from date of Substantial Completion.
    - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
  - 2. Sodded Turf: 30 days from date of Substantial Completion.
- B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:

1. Full and Partial Shade: Bermudagrass (*Cynodon dactylon*).

## 2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified, Approved, and Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass (*Cynodon dactylon*)
- C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

## 2.3 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
  2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

## 2.4 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizer in the following quantities to produce planting soil:
  1. Ratio of Loose Compost to Topsoil by Volume: 1:3.

## 2.5 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  1. Organic Matter Content: 50 to 60 percent of dry weight.
  2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.6 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 4-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
  - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
  - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
  - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply slow-release fertilizer directly to subgrade before loosening.
2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
  - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
  - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
  - b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
  - a. Apply slow-release fertilizer directly to surface soil before loosening.

3. Remove stones larger than 2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
  - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
  - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across angle of slopes exceeding 1:3.

- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

### 3.8 TURF RENOVATION

- A. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new planting soil as required.
- B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- D. Mow, dethatch, core aerate, and rake existing turf.
- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches .
- H. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- I. Apply sod as required for new turf.
- J. Water newly planted areas and keep moist until new turf is established.

### 3.9 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
  1. Mow bermudagrass to a height of 1/2 to 1 inch.
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
  1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

### 3.10 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
  1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
  2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

### 3.11 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 9200

SECTION 33 0500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping joining materials.
  - 2. Transition fittings.
  - 3. Sleeves.
  - 4. Identification devices.
  - 5. Grout.
  - 6. Flowable fill.
  - 7. Piped utility demolition.
  - 8. Piping system common requirements.
  - 9. Equipment installation common requirements.
  - 10. Painting.
  - 11. Concrete bases.
  - 12. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. CPVC: Chlorinated polyvinyl chloride plastic.
- D. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Identification devices.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

### PART 2 - PRODUCTS

#### 2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

#### 2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
  - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
  - 2. Aboveground Piping: Specified piping system fitting.

- C. AWWA Transition Couplings NPS 2 and Larger:
  - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- D. Plastic-to-Metal Transition Fittings:
  - 1. Description: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.
- E. Plastic-to-Metal Transition Unions:
  - 1. Description: MSS SP-107, CPVC and PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.
- F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
  - 1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

### 2.3 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

### 2.4 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
  - 2. Location: Accessible and visible.
- C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.
  - 1. Material: Fiberboard or Brass.
  - 2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

- D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- E. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.
  - 1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches ; 2-1/2 inches for larger pipes.
  - 2. Color: Comply with ASME A13.1, unless otherwise indicated.
- F. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
  - 1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

## 2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.6 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
  - 1. Cement: ASTM C 150, Type I, portland.
  - 2. Density: 115- to 145-lb/cu. ft.
  - 3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
  - 4. Aggregates: ASTM C 33, natural sand, fine.
  - 5. Admixture: ASTM C 618, fly-ash mineral.
  - 6. Water: Comply with ASTM C 94/C 94M.
  - 7. Strength: 100 to 200 psig at 28 days.

## PART 3 - EXECUTION

### 3.1 PIPED UTILITY DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.

- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING INSTALLATION

- A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
    - a. PVC Pipe Sleeves: For pipes smaller than NPS 6 .
- J. Verify final equipment locations for roughing-in.
- K. Refer to equipment specifications in other Sections for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

F. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

H. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

### 3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.5 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

### 3.6 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.7 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
3. Locate pipe markers on exposed piping according to the following:
  - a. Near each valve and control device.

- b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
  - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
  - d. At manholes and similar access points that permit view of concealed piping.
  - e. Near major equipment items and other points of origination and termination.
- B. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

### 3.8 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
- 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

### 3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.10 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 33 0500

SECTION 33 3913 - SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes

1. Monolithic concrete, modular precast concrete, masonry, and precast polyethylene manhole assemblies.

1.3 Related Sections

1. Section 31 2000 - Earth Moving
2. Section 33 3100 - Sanitary Sewer Systems
3. Section 33 4100 - Storm Utility Drainage Piping

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A 48 - Gray Iron Castings
2. ASTM C 55 - Concrete Building Brick
3. ASTM C 478 - Precast Reinforced Concrete Manhole Sections
4. ASTM C 923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
5. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials

B. International Masonry Industry All-Weather Council (IMIAC)

1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction

C. State Department of Transportation (DOT), Construction and Material Specifications

1.5 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings of manhole locations, elevations, piping with sizes, locations, and elevations of penetrations.

B. Product Data: Provide data for manhole covers, component construction, features, configuration, and dimensions.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Cast-In-Place Concrete: Nonreinforced cast in place concrete barrel.

1. Concrete: 3500 psi concrete conforming to Division 03.
2. Forms: Steel sheet accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.

B. Precast Concrete: Reinforced precast concrete barrel.

1. Manhole sections conforming to ASTM C 478 with gaskets in accordance with ASTM C 923.
2. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.

- C. Concrete Brick: ASTM C 55, Grade N Type I-moisture controlled, normal weight, of same grade, type and weight as block units, nominal modular size of 3 5/8-inches x 7 5/8-inches x 2 1/4-inches
- D. Precast Polyethylene:
  - 1. Manufacturer: Advanced Drainage Systems (ADS) or approved equal.
  - 2. Precast polyethylene in accordance with ASTM D 1248. Nominal cylinder internal diameter shall be 48-inches and shall be designed to accept concrete filled polyethylene manhole lids and standard cast iron frames with lid or grate.
  - 3. Manholes shall have compressive strength that meets ASTM D 2412 standards.
- E. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-inches deep shall be repaired using Class "D" mortar.
- F. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.
- G. Configuration:
  - 1. Barrel Construction: Concentric with eccentric cone top section.
  - 2. Shape: Cylindrical
  - 3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.
  - 4. Design Depth: As indicated on Construction Drawings.
  - 5. Clear Lid Opening: 22-inches minimum
  - 6. Pipe Entry: Provide openings as indicated on Construction Drawings
  - 7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with nonshrinking grout.
- H. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

## 2.2 COMPONENTS

- A. Lid and Frame:
  - 1. Manufacturer: Neenah Foundry Company, East Jordan Iron Works, or approved equal.
  - 2. ASTM A 48, Class 30B heavy duty cast iron construction, machined flat bearing surface.
  - 3. Removable lid, closed or open as indicated on Construction Drawings, sealing gasket.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify items specified by other Sections are properly sized and located.
- B. Verify that built-in items are in proper location and ready for roughing into work.
- C. Verify that the excavation for manholes is correct.

### 3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on Construction Drawings.

### 3.3 PRECAST MANHOLE CONSTRUCTION

- A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.
- B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
  - 1. After completion of slab foundation, lower first joint of manhole barrel into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert. Pour invert immediately after setting of first section of manhole barrel.
  - 2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.
- C. Set cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

#### 3.4 CAST-IN-PLACE MANHOLE CONSTRUCTION

- A. Cast-in-place shall conform to the applicable requirements of Division 03. Utilize steel forms.
- B. Place base pad to proper elevation and location and pour monolithically with invert. Base shall support pipe to first joint.
- C. Deposit concrete in evenly distributed layers of about 18 inches, with each layer vibrated to bond to preceding layer.
- D. Place gasket between all joints and paint exterior of manhole within 5' of the joint with mastic waterproofing.
- E. Place precast concrete cone.
- F. Set section cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

#### 3.5 MASONRY MANHOLE CONSTRUCTION

- A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- B. Lay masonry units in running bond. Course 3 brick units and 3 mortar joints to equal 8 inches.
- C. Form flush mortar joints
- D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- E. Install joint reinforcement 16 inches on center
- F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening
- G. As work progresses, build in fabricated metal items
- H. Cut and fit masonry for pipes as specified herein
- I. Set cover frames and covers level to correct elevations without tipping.

END OF SECTION

## SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Nonpressure transition couplings.
  - 3. Pressure pipe couplings.
  - 4. Expansion joints and deflection fittings.
  - 5. Cleanouts.
  - 6. Drains.
  - 7. Encasement for piping.
  - 8. Manholes.
  - 9. Channel drainage systems.
  - 10. Catch basins.
  - 11. Stormwater inlets.
  - 12. Stormwater detention structures.
  - 13. Pipe outlets.
  - 14. Stormwater disposal systems.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
  - 2. Catch basins or stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
  - 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

## 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 : AASHTO M 252M, Type S, with smooth waterway for coupling joints.
  - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 : AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

### 2.2 PVC PIPE AND FITTINGS

- A. PVC Corrugated Sewer Piping:
  - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
  - 3. Gaskets: ASTM F 477, elastomeric seals.
- B. PVC Profile Sewer Piping:
  - 1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: ASTM D 3034, PVC with bell ends.
  - 3. Gaskets: ASTM F 477, elastomeric seals.
- C. PVC Gravity Sewer Piping:
  - 1. Pipe and Fittings: ASTM F 679, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

### 2.3 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443 , rubber gaskets
2. Class III, Wall B.

#### 2.4 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
  1. For Concrete Pipes: ASTM C 443, rubber.
  2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
  1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
  1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
  1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

#### 2.5 PRESSURE PIPE COUPLINGS

- A. Description: AWWA C219, tubular-sleeve coupling, with center sleeve, gaskets, end rings, and bolt fasteners.
- B. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 200-psig minimum pressure rating and ends sized to fit adjoining pipes.
- C. Center-Sleeve Material: Stainless steel.
- D. Gasket Material: Natural or synthetic rubber.
- E. Metal Component Finish: Corrosion-resistant coating or material.

#### 2.6 EXPANSION JOINTS AND DEFLECTION FITTINGS

- A. Ductile-Iron Flexible Expansion Joints:
  1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron or steel with protective coating, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Description: Compound-coupling fitting, with ball joint, flexing section, gaskets, and restrained-joint ends, complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

2.7 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Medium Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.8 DRAINS

A. Cast-Iron Area Drains:

1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
2. Top-Loading Classification(s): Medium and Heavy Duty.

2.9 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch or minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

2.10 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
9. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.11 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R , and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
  - a. Invert Slope: 1 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
  - a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

## 2.12 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

B. Sloped-Invert, Polymer-Concrete Systems:

1. Channel Sections:

- a. Interlocking-joint, precast, modular units with end caps.
- b. 4-inch inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.
- c. Extension sections necessary for required depth.
- d. Frame: Include gray-iron or steel frame for grate.

2. Grates:

- a. Manufacturer's designation "Heavy Duty," with slots or perforations that fit recesses in channels.
- b. Material: As indicated on Drawings.

3. Covers: Solid gray iron if indicated.

4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

C. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

- a. Interlocking-joint, precast, modular units with end caps.
- b. 5-inch inside width and 9-3/4-inch- deep, rounded bottom, with level invert and with NPS 4 outlets in quantities, sizes, and locations indicated.

2. Grates:

- a. Slots or perforations that fit recesses in channels.
- b. Material: As indicated on Drawings.

3. Covers: Solid gray iron if indicated.

4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

D. Wide-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

- a. Interlocking-joint, precast, modular units with end caps.
- b. 8-inch inside width and 13-3/4-inch- deep, rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.

2. Grates:
    - a. Slots or other openings that fit recesses in channels.
    - b. Material: As indicated on Drawings.
  3. Covers: Solid gray iron if indicated.
  4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
- E. Drainage Specialties: Precast, polymer-concrete units.
1. Large Catch Basins:
    - a. 24-by-12-inch polymer-concrete body, with outlets in quantities and sizes indicated.
    - b. Gray-iron slotted grate.
    - c. Frame: Include gray-iron or steel frame for grate.
  2. Small Catch Basins:
    - a. 19- to 24-inch by approximately 6-inch polymer-concrete body, with outlets in quantities and sizes indicated.
    - b. Gray-iron slotted grate.
    - c. Frame: Include gray-iron or steel frame for grate.
  3. Oil Interceptors:
    - a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- thick, steel-plate covers.
    - b. Steel-plate covers.
    - c. Capacity: gallons as indicated on Drawings
    - d. Inlet and Outlet: NPS 6.
  4. Sediment Interceptors:
    - a. 27-inch- square, polymer-concrete body, with outlets in quantities and sizes indicated.
    - b. 24-inch- square, gray-iron frame and slotted grate.
- F. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- G. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- 2.13 PLASTIC, CHANNEL DRAINAGE SYSTEMS
- A. General Requirements for Plastic, Channel Drainage Systems:
    1. Modular system of plastic channel sections, grates, and appurtenances.
    2. Designed so grates fit into frames without rocking or rattling.
    3. Number of units required to form total lengths indicated.
  - B. PE Systems:
    1. Channel Sections: Interlocking-joint, PE modular units, 4 inches wide, with end caps. Include rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.
    2. Grates: PE, ladder shaped; with stainless-steel screws.

3. Color: Gray unless otherwise indicated.
4. Drainage Specialties: Include the following PE components:
  - a. Catch Basins: 12-inch- square plastic body, with outlets in quantities and sizes indicated. Include PE slotted grate 11-3/4 inches square by 1-1/8 inches thick.
- C. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- D. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

## 2.14 CATCH BASINS

### A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 , bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
8. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP , wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

### B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

### C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

## 2.15 STORMWATER INLETS

### A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards or as indicted on Drawings.

### B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards or as indicted on Drawings. Include heavy-duty frames and grates.

- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards or as indicated on Drawings. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, according to utility standards or as indicated on Drawings.

#### 2.16 STORMWATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
  - 1. Ballast: Increase thickness of concrete as required to prevent flotation.
  - 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
  - 3. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP , wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of structure to finished grade is less than 60 inches.
- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

#### 2.17 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron, tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
  - 1. Average Size: NSSGA No. R-5, screen opening 5 inches .
- C. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

#### 2.18 STORMWATER DISPOSAL SYSTEMS

- A. Pipe Systems: Perforated manifold, header, and lateral piping complying with AASHTO M 252M for NPS 10 and smaller, AASHTO M 294M for NPS 12 to NPS 60. Include proprietary fittings, couplings, seals, and filter fabric.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

#### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 3. Install piping with 36-inch minimum cover.
  - 4. Install PE corrugated sewer piping according to ASTM D 2321.
  - 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 6. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
  - 1. Expansion joints and deflection fittings.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
  - 2. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
  - 3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
  - 4. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
  - 5. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  - 6. Join dissimilar pipe materials with nonpressure-type flexible couplings.

### 3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### 3.5 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
  - 1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
- B. Embed drains in 4-inch minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

### 3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 6 inches above finished surface elsewhere unless otherwise indicated.

### 3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

### 3.8 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.10 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.
- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.11 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

3.12 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi .
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 . Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi .
  - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."
  - D. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
    1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      - a. Shielded flexible couplings for same or minor difference OD pipes.
      - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
    2. Use pressure-type pipe couplings for force-main joints.

### 3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  1. Close open ends of piping with at least 12-inch-thick, brick masonry bulkheads.
  2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
  1. Remove manhole or structure and close open ends of remaining piping.
  2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

### 3.14 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  1. Use warning tape or detectable warning tape over ferrous piping.
  2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### 3.15 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
  - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
  - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
  - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
  - d. Infiltration: Water leakage into piping.
  - e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
  - a. Option: Test plastic piping according to ASTM F 1417.
  - b. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.16 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 33 4100

# LONGVIEW MULTIMODAL TRANSPORTATION CENTER

## Geotechnical Report

### Attachment 1

Note: The Geotechnical Report is provided for reference only. Borings, soil profiles, water elevations, and underground utilities shown on the plans or provided in this enclosure or by any other means of transmission were obtained for use for the Engineer in the preparation of plans. This information is provided for the Bidder's information only and the Engineer and/or Owner make no representation as to the accuracy of the data.

Project Owner:



Prepared By:



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8/18/2015



GEOTECHNICAL ENGINEERING  
ENVIRONMENTAL CONSULTING  
CONSTRUCTION MATERIALS ENGINEERING AND TESTING

August 5, 2015

Mr. Travis Crafton, P.E.  
**Johnson & Pace Incorporated**  
1201 NW Loop 281, Suite 100  
Longview, Texas 75604

**Re: Geotechnical Investigation  
Phase I Improvements  
Longview Multimodal Transportation Center  
City of Longview, Texas  
AGG Report No. LE15-018**

Dear Mr. Crafton:

Submitted herein is our geotechnical report for the project referenced above. This study was authorized by Mr. Travis Crafton, P.E. on June 30, 2015. This report was delayed awaiting traffic and loading conditions provided by the owner. This report describes the results of our field and laboratory investigations together with recommendations for the design and construction of the planned project.

For your construction materials testing and related quality assurance requirements, it is recommended that this work be performed by Alliance Geotechnical Group, Inc. in order to maintain continuity of inspection and testing services for the project under the direction of the geotechnical project engineer.

We appreciate the opportunity to assist you on this project phase. Please call should you have any questions or when we can be of further assistance.

Sincerely,

**ALLIANCE GEOTECHNICAL GROUP, INC.**

Terry W. Oswald, P.E.  
Vice President



8/5/15

TBPE Firm Registration  
Number 1970

Copies Submitted: (3)



**GEOTECHNICAL INVESTIGATION  
PHASE I IMPROVEMENTS  
LONGVIEW MULTIMODAL TRANSPORTATION CENTER  
CITY OF LONGVIEW, TEXAS  
AGG REPORT NO. LE15-018**

**TO  
JOHNSON & PACE INCORPORATED  
LONGVIEW, TEXAS**

**BY  
ALLIANCE GEOTECHNICAL GROUP, INC.  
LONGVIEW, TEXAS**

**AUGUST 5, 2015**

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- APPENDIX B:** AASHTO PAVEMENT ANALYSES AND DESIGN STUDIES

**GEOTECHNICAL INVESTIGATION  
PHASE I IMPROVEMENTS  
LONGVIEW MULTIMODAL TRANSPORTATION CENTER  
CITY OF LONGVIEW, TEXAS**

**1. PROJECT DESCRIPTION**

The proposed project includes the construction of new entrance/exit drives (Phase I) at the existing Longview Multimodal Transportation Center in the City of Longview, Texas. Specifically, the new (divided) drives will be located to the south of the existing drive, along Mobberly Avenue. It is understood that Portland cement concrete (PCC) pavement sections are planned for the new drives. Based on discussions with the client, it is understood that new pavement grades are generally anticipated to match existing grades. Therefore, minimal site grading (cuts and fills of less than about one (1) foot) is anticipated to achieve final pavement grades along the majority of the alignment. Isolated areas may require deeper cuts and fill depths to facilitate surface drainage and construction of the new roadway, if appropriate. A general layout of the site is shown on the Plan of Borings, Figure 1.

**2. PURPOSE AND SCOPE**

This investigation was designed to evaluate subsurface conditions at the project site and to develop engineering soil design parameters and recommendations to be used to guide design and construction of the planned project. Our scope of services included:

1. performing concrete pavement cores and/or penetrations and thickness measurements within the limits of two (2) exploratory boring for evaluation of pavement components and thicknesses;
2. obtaining samples of the subsurface soil formations and making groundwater observations within the limits of two (2) shallow exploratory borings for evaluation of general soil and groundwater conditions;
3. performing laboratory soil tests for soil classification of the subsurface strata;
4. performing pavement analyses and design studies in accordance with AASHTO design methods for new pavement construction based on traffic data provided by the client, including anticipated traffic loading conditions (number of axles, axle types, and individual axle loads) and frequency;
5. providing recommended pavement sections for new pavement construction;
6. providing recommendations for pavement subgrade preparation, including recommended dosage rates of stabilization additive and guideline specifications for subgrade stabilization;
7. providing recommendations for compaction of earthwork and recommendations for suitable fill materials, placement, and compaction; and;
8. discussion of potential construction problems.

### **3. FIELD INVESTIGATION**

Subsurface conditions were evaluated by two (2) sample test borings drilled on June 26, 2015 along the new drive alignments. Boring locations were selected jointly by representatives of Johnson & Pace Incorporated and Alliance Geotechnical Group, Inc., and located in the field by representatives of Alliance Geotechnical Group, Inc. The approximate boring locations are shown on the Plan of Borings, Figure 1.

Borings were drilled to depths of about five (5) feet below existing grade to evaluate subsurface conditions within the limits of the proposed improvements. Sample depth, soil description and classification (based on the Unified Soil Classification System) are shown on the Logs of Borings, Figures 2 and 3. A key to the descriptive terms and symbols used on the logs is presented on Figure 4.

The components of the existing pavement sections were carefully measured during field operations. The results of all field measurements are included on the boring logs. The borings were advanced using continuous flight augers. Intermittent samples were obtained using a split-barrel sampler in conjunction with the Standard penetration test (SPT). The samples were visually examined in the field by an Alliance Geotechnical Group, Inc. geotechnical engineer, classified, and packaged for transport to the laboratory for further identification and classification. Borings were drilled dry, without the aid of drilling fluids, to allow groundwater observations while drilling. Groundwater observations were made during drilling and after completion of the borings. These observations are reported on the boring logs. The borings were backfilled with soil cuttings and tamped after final groundwater level measurements were obtained. The pavement surface at Boring B-1 was patched using rapid-set concrete patch after final groundwater level measurements were obtained.

### **4. LABORATORY INVESTIGATION**

Upon return to the laboratory, representative specimens were selected for testing. The laboratory testing program was directed toward evaluation of the physical and engineering characteristics of the subsurface soils.

Classifications were verified by determination of natural moisture content, liquid and plastic limits, and percent fines passing the No. 200 sieve. The results of these tests are tabulated at the appropriate sample depth on the boring logs.

Strength characteristics of the subsurface soils were evaluated in the field by Standard penetration tests (SPT). These test results are also shown at the appropriate sample depth on the boring logs.

All field and laboratory tests were performed in accordance with ASTM test standards.

### **5. GENERAL SITE AND SUBSURFACE CONDITIONS**

#### **5.1 Site Conditions**

The site of the proposed improvements is located to the south of the existing drive, along Mobberly Avenue, at the existing Longview Multimodal Transportation Center in the City of Longview, Texas. At the time of this investigation, a metal building covered the majority of the new alignments. Surficial crushed stone base is scattered along the west side of the metal building. The northern portion of the new drive alignments will tie into the existing

concrete pavement sections. Based on discussions with the client, it is understood that new pavement grades are generally anticipated to match existing grades. Therefore, minimal site grading (cuts and fills of less than about one (1) foot) is anticipated to achieve final pavement grades along the majority of the alignment. Isolated areas may require deeper cuts and fill depths to facilitate surface drainage and construction of the new roadway, if appropriate. A general layout of the site is shown on the Plan of Borings, Figure 1.

## **5.2 Subsurface Conditions**

The components of the existing pavement sections were carefully measured during field operations. The results of all field measurements are included on the boring logs. In general, the near surface materials encountered at Boring B-1 consist of approximately six (6) inches of crushed stone base materials underlain by approximately six (6) inches of a mixture of crushed concrete and brick fragments and oiled dirt, which is underlain by approximately six (6) inches of what appears to be deteriorated concrete pavement or possibly cement treated base. The deteriorated concrete pavement or cement treated base materials are relatively hard and are evidenced by the difficulty in penetrating the materials with the flight augers. The approximately six (6) inch thick reinforced concrete pavement section encountered at Boring B-2 is underlain by approximately three (3) inches of oiled dirt. Based on visual observations and the difficulty in coring the existing concrete pavement using a diamond-tipped core barrel, the concrete pavement appears to be very hard, containing hard gravel large aggregate. Based on visual examination of the subgrade soils immediately below the pavement sections using phenolphthalein, the subgrade soils encountered beneath the pavement sections do not appear to have been stabilized (not detectable using phenolphthalein indicator).

The existing pavement sections encountered at the boring locations are underlain by relatively low plasticity sandy fill soils to depths ranging from about 2 to 4 feet below existing grade at the boring locations. Specifically, soft and wet brown silty sandy clay (CL) fill soils were encountered in Boring B-1 to a depth of about 4 feet below existing grade, as shown on the boring log. Likewise, loose brown silty clayey sand (SC) fill soils were noted in Boring B-2 to a depth of about 2 feet below existing grade, as shown on the boring log. The sandy fill soils revealed Standard penetration test (SPT) blow counts ranging from about 2 to 7 blows per foot of penetration. These sandy fill soils exhibited liquid limits ranging from about 18 to 27, plasticity indices (PI's) ranging from about 6 to 14, and contained about 43 to 61 percent fines (silt and clay passing the No. 200 sieve).

The sandy fill soils encountered in Boring B-1 are underlain by moderately plastic (CL) light gray and reddish brown silty sandy clay soils containing varying amounts of ironstone fragments. These silty sandy clay soils are considered medium stiff in consistency at the present time, having Standard penetration test (SPT) blow counts of about 6 blows per foot of penetration. These silty sandy clay soils exhibited a liquid limit of about 45, a plasticity index (PI) of about 30, and contained about 59 percent fines (silt and clay passing the No. 200 sieve).

The sandy fill soils encountered in Boring B-2 are underlain by highly plastic (CH) clay soils. Specifically, highly plastic (CH) dark gray and dark brown clay soils were encountered to a depth of about 3.5 feet below existing grade. These clay soils are underlain by deeper highly plastic (CH) gray and reddish brown clay soils containing iron stains. These clay soils are considered medium stiff to stiff in consistency at the present time, having Standard penetration test (SPT) blow counts of about 11 blows per foot of penetration. These clay

soils exhibited liquid limits ranging from about 67 to 75, plasticity indices (PI's) ranging from about 49 to 57, and contained about 81 to 82 percent fines (silt and clay passing the No. 200 sieve).

### **5.3 Groundwater Conditions**

At the time of this investigation, groundwater seepage was encountered during the drilling operations in Boring B-1 at a depth of about 4 feet below existing grade as indicated on the boring log. Water level observations performed upon completion of the respective borings revealed groundwater at a depth of about 3 feet below existing grade in Boring B-1 as indicated on the boring log. Boring B-2 was dry and open to its 5-foot drilled depth of the boring upon completion of the drilling operations. It should be recognized that groundwater levels will fluctuate with variations in seasonal precipitation and surficial runoff. If construction occurs during or following periods of heavy rainfall, shallow groundwater may be encountered in the form of seepage within the granular soils layers and through the cracks, fissures and fractures within the overburden clay soils, as well as discontinuities in the on-site fill soils. Future construction activities may also alter the surface and subsurface drainage characteristics of this site. Therefore, the depth of groundwater should be verified just prior to construction. If there is a noticeable change from the conditions reported herein, Alliance Geotechnical Group, Inc. should be notified immediately to review the effects it may have on the design recommendations. It is not possible to accurately predict the magnitude of subsurface water fluctuation that might occur based upon short-term observations.

Shallow groundwater levels are not desired for optimum pavement performance. Shallow groundwater levels cause pumping of sandy subgrade soils, strength loss of clayey subgrade soils and premature deterioration of the pavement sections. It is our opinion that the elevated groundwater level encountered in Boring B-1 is likely caused by trapped "perched" groundwater contained in the sandy fill soils.

## **6. ANALYSES AND GEOTECHNICAL RECOMMENDATIONS**

The recommendations given in this report were prepared exclusively for Johnson & Pace Incorporated, the City of Longview, Texas, and their design consultants. The information supplied herein is applicable for the design of the previously described improvements to be constructed at the location indicated at this site and should not be used for any other purpose.

### **6.1 Traffic Loading Conditions**

Traffic data required for our pavement analyses and design studies was obtained by the City of Longview. These data are included in Appendix A. Specifically, traffic data (traffic counts) was collected by the City of Longview on Tuesday, July, 21, 2015, along the West Bound and East Bound Lanes of Pacific Avenue (entrance drive) at Mobberly Avenue. These data (for standard Federal Highway Administration (FHWA) vehicle classifications) are summarized on Table A in Appendix A. Based on review of the traffic data, it appears that the City of Longview Transportation (COLT) bus traffic is included as FHWA Vehicle Classification 5 (2 Axle 6 Tire). However, the traffic data does not include Bus traffic from the Greyhound Bus facilities. Therefore, Bus Traffic for the Greyhound Bus facilities were developed by Alliance Geotechnical Group based on the Greyhound Bus schedule (daily traffic), as well as published data found online regarding the loading conditions of the

various Greyhound buses. Based on the online schedule, it appears that a total of six (6) buses arrive and depart daily at the Longview facilities.

Table A in Appendix A summarizes the traffic data within the design lane utilized for this project. Axle loading (weights) conditions for the respective FHWA vehicle classifications were developed based on published data. Table B in Appendix B summarizes the combined axle loading conditions estimated for the first year as required for the pavement analyses and design studies.

## 6.2 Pavement Subgrade Design Parameters

Based on discussions with the client, it is understood that new pavement grades are generally anticipated to match existing grades. Therefore, minimal site grading (cuts and fills of less than about one (1) foot) is anticipated to achieve final pavement grades along the majority of the alignment. Isolated areas may require deeper cuts and fill depths to facilitate surface drainage and construction of the new roadway, if appropriate. Therefore, exposed subgrade soils along the proposed alignment are anticipated to consist of low plasticity silty clayey sand (SC), relatively low to moderately plastic (CL) silty sandy clay and highly plastic (CH) clay soils, both fill and natural.

It is recommended that the subgrade soils in all pavement areas be treated with stabilization additives to provide a stable working platform for new pavement construction and increase the long term performance of the pavement sections. Due to the presence of surficial low plasticity sandy subgrade soils, cement treatment of the pavement subgrade soils should be considered for this project. Cement treatment of pavement subgrade soils should be performed to provide firm, stable subgrade soil conditions for new pavement construction and to minimize piping beneath the pavement sections after construction.

California Bearing Ratio (CBR) tests were not included in our scope of services for this project. However, based on our experience with similar soils, it is recommended that a CBR value of about 2 to 3 be used for the design of these pavement sections. It is our opinion that a CBR value of about 2 to 3 is relatively conservative and should be representative of actual field conditions. It cannot be overemphasized that proofrolling is imperative to assure that a firm subgrade is present beneath the new pavement sections. The proofrolling operations should be performed prior to fill placement, as well as prior to subgrade treatment operations to ensure a firm subgrade is present prior to the treatment operations. The recommended CBR value indicated below for pavement design is based on the assumption that a firm subgrade (verified by proofrolling), having adequate moisture content and density, be provided and maintained during construction, and that treatment of the subgrade soils is performed as outlined below.

Pavement design requires the use of soil properties or the results of specific tests to determine appropriate design parameters. Based on the results of the field and laboratory investigation, on soil plasticity properties and the above recommendations concerning removal and replacement of the near surface sand layers and providing firm subgrade soils, etc., the following parameters were used:

Subgrade Soil:

Silty Clayey Sands, Silty Sandy  
Clays, & Clay, Both Fill and  
Natural

Classification by USCS:	SC, CL & CH
California Bearing Ratio (CBR):	2 to 3
Modulus of Subgrade Reaction (k):	75 pci
Modified Modulus of Subgrade Reaction Using a 8-inch Treated Subgrade:	100 pci

### 6.3 Pavement Design – AASHTO Guide for Design of Pavement Structures (1993)

Pavement analyses and design studies were performed in accordance with AASHTO Guide for Design of Pavement Structures (1993), using the computer program 'Pavement Analysis Software (PAS)', published by the American Concrete Pavement Association, based on traffic data provided by the client. Print-outs of these pavement design studies are included in Appendix B.

The following parameters were used during our pavement analyses and design studies:

#### Pavement Design Parameters

Estimated Annual Traffic Growth:	1%
Reliability:	85%
Overall Deviation:	0.35 (Rigid Pavement)
Initial Serviceability Index:	4.5 (Rigid Pavement)
Terminal Serviceability Index:	2.25
28-day Mean PCC Modulus of Rupture:	500 psi
28-day Mean Modulus of Elasticity:	3,375,000 psi
Load Transfer Coefficient, J:	3.2
Drainage Coefficient:	0.9
20-Year Design Life (Design Lane): Traffic (Rigid Pavement):	985,984 18-kip ESAL
30-Year Design Life (Design Lane): Traffic (Rigid Pavement):	1,578,200 18-kip ESAL
35-Year Design Life (Design Lane): Traffic (Rigid Pavement):	1,898,286 18-kip ESAL

Based on the traffic data and design parameters listed above, pavement design studies performed in accordance AASHTO Guide for Design of Pavement Structures (1993), using the computer program 'Pavement Analysis Software (PAS)', published by the American Concrete Pavement Association calculated a thickness of Portland cement concrete pavement of 8.20 inches (8 inches) based on a 20 year design life. Likewise, a thickness of Portland cement concrete pavement of 8.84 inches and 9.10 inches (9 inches) was calculated based on a 30 and 35 year design life, respectively. Print-outs of these pavement design studies are included in Appendix B.

The following pavement sections should be considered for this project. Adequate subgrade preparation, subgrade treatment and drainage is essential to pavement performance in accordance with design criteria.

Pavement Course	Pavement Component	Thickness	
		20-Year Life	30 to 35-Year Life
Surface	Portland Cement Concrete Pavement, TxDOT Item 360 (2014 Edition), Class P, minimum 3,200 psi compressive strength at 7 days and a minimum 4,000 psi compressive strength at 28 days with No. 4 bars on 18 inch spacings, center to center, each way (maximum 15-foot joint spacing). All coarse aggregate <u>shall</u> consist of <u>crushed</u> stone.	8.0"	9.0"
Subgrade	Cement Treated Subgrade, TxDOT Item 275 (2014 Edition), minimum 4% Type I, Type II, or Type I/II Portland cement by dry weight (minimum 30 pounds per square yard), compacted to a minimum of 95% <u>standard</u> Proctor density (ASTM D698), at a moisture content ranging from four percentage points below to one percentage point above the optimum moisture value (-4% to +1%).	8.0"	8.0"

Careful attention should be given to subgrade preparation, subgrade treatment, and drainage since pavement performance is highly dependent on proper subgrade support and drainage. Guideline specifications for the installation of pavement subgrade, cement treated subgrade, and reinforced Portland cement concrete pavement are provided in the following sections of this report.

#### 6.4 Differential Upward Pavement Movements

It is important to consider the potential for differential upward pavement movement due to post-construction soil swelling in areas where new pavement construction is performed adjacent to existing pavement sections. Optimum moisture levels are usually present beneath existing pavement sections since the existing pavement section serves as a moisture barrier in preventing moisture losses in the underlying clays. However, where new construction is performed over unpaved and unprotected highly plastic clay soils exposed to moisture losses through evaporation, the clay soils in these unprotected areas usually have a higher swell potential (higher PVR) unless construction occurs during the rainy season when the surficial clays are moist. Due to the presence of surficial, low plasticity sandy fill soils at the boring locations, the subgrade soils should have a relatively low swell potential. However, moderately to highly plastic (CL and CH) clay soils may be exposed at subgrade elevation in areas of this site. If moderately to highly plastic (CL and CH) clay soils are exposed at subgrade elevation and construction occurs during or after prolonged periods of hot and dry weather conditions, the surficial clays will dry rapidly. Therefore, it is recommended that the moisture content within the existing clay subgrade soils be maintained during construction. If clay subgrade soils are exposed at subgrade elevation and are allowed to become excessively dry during construction, excavation/mechanical reworking of the on-site clays in moisture controlled lifts should be performed to a minimum depth of 12 inches below the bottom of the treated subgrade as outlined below.

## 6.5 Pavement Subgrade Preparation

Based on discussions with the client, it is understood that new pavement grades are generally anticipated to match existing grades. Therefore, minimal site grading (cuts and fills of less than about one (1) foot) is anticipated to achieve final pavement grades along the majority of the alignment. Isolated areas may require deeper cuts and fill depths to facilitate surface drainage and construction of the new roadway, if appropriate. Therefore, exposed subgrade soils along the proposed alignment are anticipated to consist of low plasticity silty clayey sand (SC), relatively low to moderately plastic (CL) silty sandy clay and highly plastic (CH) clay soils, both fill and natural.

Surface drainage is critical to the performance of these pavements. Water should be allowed to exit the pavement surface quickly. This can be accomplished by maintaining at least 1% to 2% slope of the finished grades and discharging the water into inlet boxes or curb cuts. It cannot be overemphasized that it is imperative that a firm subgrade condition be provided (verified by proofrolling) and maintained during construction. Recommended earthwork construction and pavement subgrade preparation procedures are as follows:

1. Remove and waste any surface vegetation, organic topsoil, loose organics, debris, and any undesirable materials from the construction area. All tree stumps and associated roots, if applicable, shall be completely removed to depths of at least four (4) feet below existing grade prior to fill placement or four (4) feet below final grade, whichever is deeper. Tree stumps and root holes shall be filled in compacted lifts in accordance with Item 3, below. Usable topsoil should be stockpiled for later use in landscaping. Usable topsoil should be stockpiled for later use in landscaping. Topsoil is defined as the surface soil layer containing organic matter and minor plant roots, free of debris or other deleterious materials.

As part of the site preparation, good surface drainage should be initiated at the beginning of construction and maintained thereafter to prevent ponding of water in the pavement and fill areas. Surface water should be pumped immediately from the construction area after each rain and a firm subgrade maintained.

2. All pavement and fill areas shall be proofrolled prior to fill placement to detect any areas of weakness. In cut areas, the soil shall be cut to rough grade prior to proofrolling. Proofrolling shall be performed in accordance with Texas Department of Transportation (TxDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014 Edition, Item 216, Proofrolling. The proofrolling operations should be observed by an experienced Alliance Geotechnical Group, Inc. engineer or geotechnician to verify that firm non-yielding subgrade soils are present. Any soft or compressible areas detected during proofrolling shall be undercut until firm soil is exposed. Low areas resulting from undercutting shall be filled in compacted lifts in accordance with Item 3, below. It cannot be overemphasized that the proofrolling is imperative to assure that a firm subgrade is present beneath the new pavement section. It is also imperative that a firm subgrade be provided and maintained during construction.
3. In fill areas, scarify the exposed subgrade (after proofrolling) to a minimum depth of eight (8) inches, adjust the moisture content and recompact to within the limits indicated below. Sandy soils having a plasticity index (PI) of 15 or less shall be compacted to a minimum of 95% of the maximum density defined by ASTM D-698 (standard Proctor), at

a moisture content within three percentage points ( $\pm 3\%$ ) of the optimum moisture value. Sandy clay soils having a plasticity index (PI) between 16 and 25 shall be compacted to a minimum of 95% of the maximum density defined by ASTM D-698 (standard Proctor), at a moisture content ranging from one percent below to four percentage points above the optimum moisture value (-1% to +4%). Clay soils having a plasticity index (PI) of 26 or more shall be compacted to between 95% and 100% of the maximum density defined by ASTM D-698 (standard Proctor), at a moisture content ranging from one to six percentage points above the optimum moisture value (+1% to +6%). The recommended moisture content at the time of compaction and the density limits are listed below based on the plasticity index (PI) of the respective subgrade and/or fill soils.

<u>Plasticity Index (PI)</u>	<u>Moisture Content Range at Time of Compaction (%)</u>	<u>Percent Maximum Dry Density (%) *</u>
$\leq 15$	$\pm 3\%$	95% +
16 to 25	-1% to +4%	95% +
$\geq 26$	+1% to +6%	95% to 100%

\* Percent of the maximum density defined by ASTM D-698 (standard Proctor).

- Where fill is required to achieve the desired grades, such material may consist of on-site soils, or their approved off site equal. All off-site fill soils shall be free of organic matter, or rock fragments larger than two (2) inches in any dimension, and possessing a plastic index (PI) between 5 and 25, with a liquid limit of 40 or less. Use of rock fragments and/or soil clods greater than two (2) inches in any dimension should be prohibited, since attaining uniform moisture and density without voids would be difficult. All fill shall be placed in properly benched horizontal lifts not exceeding eight (8) inches in thickness and compacted in accordance with the moisture content and density requirements indicated above in Item 3. The first lift of fill shall be placed within 48 hours of satisfactory compaction of the underlying subgrade soils. Likewise, subsequent lifts of fill shall be placed and compacted within 48 hours of satisfactory compaction of the previous lift of fill.

All fill shall be placed in properly benched horizontal lifts not exceeding eight (8) inches in thickness and compacted in accordance with the moisture content and density requirements indicated above in Item 3. If shallow fills are required along sideslopes, the sideslopes shall be properly benched prior to fill placement to allow placement of fill soils in horizontal compacted lifts. Horizontal benches must be sufficiently wide to accommodate both the construction equipment and to allow for the related placement and compaction operations. Placement of fill soils in sloped lifts shall not be allowed, regardless of fill depths. Where cuts are required along existing sideslopes, the slopes should be compacted after excavation to final grade to tighten the surficial soils loosened during excavation operations.

- As discussed above in Section 6.4, Differential Upward Pavement Movements, due to the presence of surficial, low plasticity sandy fill soils at the boring locations, the subgrade soils should have a relatively low swell potential. However, moderately to highly plastic (CL and CH) clay soils may be exposed at subgrade elevation in areas of this site. If moderately to highly plastic (CL and CH) clay soils are exposed at subgrade

elevation and construction occurs during or after prolonged periods of hot and dry weather conditions, the surficial clays will dry rapidly. Therefore, it is recommended that the moisture content within the existing clay subgrade soils be maintained during construction. If clay subgrade soils are exposed at subgrade elevation and are allowed to become excessively dry during construction, excavation/mechanical reworking of the on-site clays in moisture controlled lifts may be required to minimize potential upward pavement movements.

During construction, the subgrade soils shall be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to field delineate areas requiring excavation/mechanical reworking at the time of construction. If clay subgrade soils are exposed at subgrade elevation, and are allowed to become excessively dry during construction, excavation/mechanical reworking of the on-site clays in moisture and density controlled lifts should be considered to minimize potential upward pavement movements. The upper 12 inches of subgrade shall be excavated and stockpiled on-site. Excavation shall extend a minimum of three (3) feet beyond the limits of the pavement section (five (5) feet is preferred). The underlying clay subgrade soils shall then be scarified to a minimum depth of eight (8) inches, the moisture content adjusted and the subgrade recompacted in accordance with Item 3, above. Subsequent fill placement should be performed in maximum six (6) inch lifts in accordance with the moisture content and density requirements indicated above, Item 3. The first lift of fill shall be placed within 48 hours of satisfactory compaction of the underlying subgrade soils. Likewise, subsequent lifts of fill shall be placed and compacted within 48 hours of satisfactory compaction of the previous lift of fill.

Note: A pulverizing rotary mixer (commonly used during subgrade stabilization operations) shall be used to achieve a relatively uniform moisture content within each lift of clay fill, as specified above, prior to compaction of each lift.

6. The upper eight (8) inches of the subgrade in all pavement areas should be cement treated in accordance with the applicable provisions of Item 275 of the Texas Department of Transportation (TxDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014 Edition. A minimum of four percent (4%) Type I, Type II, or Type I/II Portland cement (minimum 30 pounds/square yard for an eight (8) inch treatment depth) should be used in all pavement areas as outlined below in Section 6.6, Cement Treatment of Pavement Subgrade Soils.

It should be noted that additional mixing and/or additional cement may be required where low plasticity subgrade soils (having a plasticity index (PI) over 15) are present in order to achieve the specified pulverization (field gradation) requirements within two (2) hours of the application of cement as specified in Item 275 of the TxDOT specifications referenced below.

7. Verify compaction of pavement fill and/or treated subgrade by in-place (nuclear) density tests (ASTM D6938) at the rate of at least one test per 1,000 square yards for each lift or a minimum of three (3) tests per construction area for each lift, whichever is greater.

At each in-place density test location performed on the treated subgrade soils, a representative sample of the treated subgrade soils shall be obtained and laboratory oven dried moisture content tests (ASTM D2216) performed to determine the moisture content

of the subgrade soils. The dry density values used for evaluating compaction levels (percent density) shall be calculated based on the wet density values determined in the field in accordance with ASTM D6938 (nuclear method) and the oven dried moisture contents determined in the laboratory in accordance with ASTM D2216.

Areas adjacent to existing pavement should be compacted per specification requirements so that a strip of poorly compacted soils is not left due to access limitations of the heavy equipment. Hand compaction equipment may be required to achieve adequate compaction levels along edges of new construction abutting existing pavement sections. This includes compaction of the treated and untreated subgrade soils.

8. Each construction area should be shaped to provide drainage of surface water. Surface water should not be allowed to pond. Surface water should be pumped immediately from each construction area after each rain and a firm subgrade maintained.
9. The moisture content and density within the completed subgrade shall be maintained during construction, until application of the prime coat has been completed, if applicable.

**6.6 Cement Treatment of Pavement Subgrade Soils**

Cement treatment of the pavement subgrade should be accomplished in accordance with the applicable provisions of Item 275 of the Texas Department of Transportation (TxDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014. The compaction requirements indicated below should be specified in lieu of the requirements recommended by TxDOT.

Where possible, it would be beneficial to treat the subgrade soils at least five (5) feet beyond the pavement edges. These extended limits should aid in reducing pavement movements and cracking along the pavement edges due to seasonal moisture variations after construction.

Type I, Type II, or Type I/II Portland cement should be added to the subgrade after removal of all surface vegetation and debris. Cement should be added only to that area where the mixing, compaction and fine grading can be completed in daylight within two (2) hours of application, and in one continuous operation. A minimum of four percent (4%) Type I, Type II, or Type I/II Portland cement should be used in all pavement areas. The required application rate for a four percent (4%) treatment depth of eight (8) inches is outlined below.

<u>Application (percent)</u>	<u>Depth of Treatment (inches)</u>	<u>Type I, II, I/II Portland Cement Required (pounds/square yard) *</u>
4	8	30

\* The recommended cement quantities have been adjusted to compensate for construction tolerances (non-uniformity) associated with lime spreading and rotary mixing. It should be recognized that low plasticity subgrade soils having a plasticity index (PI) in excess of 15, if encountered, may require additional mixing and/or additional cement in order to achieve the specified pulverization (field

gradation) requirements within two (2) hours of the application of cement as specified in Item 275 of the TxDOT specifications referenced herein.

Rotary mixing to depths in excess of those specified should be prohibited in order to prevent dilution of the required cement dosage. The mixing depths during construction should not be less than the specified depth of treatment and should be no more than one (1) inch deeper than the specified treatment depth.

Approval of final mixing operations should be based on pulverization (field gradation) tests with at least 60 percent of the cement treated soil passing the No. 4 sieve, at a moisture content near optimum in accordance with TxDOT standards. Pulverization (field gradation) tests should be performed at the rate of at least one test per 1,000 square yards of surface area or a minimum of three (3) tests per construction area, whichever is greater.

The cement treated subgrade soils should be compacted to a minimum of 95 percent of the maximum dry density defined by the standard Proctor test (ASTM D698), at a moisture content ranging from four percentage points below to one percentage point above the optimum moisture value (-4% to +1%).

Areas adjacent to existing pavement should be compacted per specification requirements so that a strip of poorly compacted soils is not left due to access limitations of the heavy equipment. Hand compaction equipment may be required to achieve adequate compaction levels along edges of new construction abutting existing pavement sections and/or structure.

Verify compaction of pavement subgrade by in-place (nuclear) density tests (ASTM D6938) performed at the rate of at least one test per 1,000 square yards of surface area or a minimum of three (3) tests per construction area, whichever is greater. At each in-place density test location, a representative sample of the treated subgrade soils shall be obtained and laboratory oven dried moisture content tests (ASTM D2216) performed to determine the moisture content of the subgrade soils. The dry density values used for evaluating compaction levels (percent density) shall be calculated based on the wet density values determined in the field in accordance with ASTM D6938 (nuclear method) and the oven dried moisture contents determined in the laboratory in accordance with ASTM D2216.

Untreated leveling sand should be specifically prohibited beneath pavement areas during final grading (after treatment operation), since these more porous soils can allow water inflow, resulting in strength loss of subgrade soils. It should be specified that only treated soil will be allowed for fine grading in accordance with TxDOT standards. After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompacted to obtain a tight non-yielding subgrade.

After blue top stakes have been set in preparation for fine grading, the depth of the treated subgrade should be measured to verify that the specified depth of treatment has been achieved below final pavement subgrade elevation. Verify thickness of the treated subgrade soils at the rate of at least one test per 1,000 square yards of surface area or a minimum of three (3) tests per construction area, whichever is greater.

It cannot be overemphasized that the mixing depths be monitored during construction in order to prevent dilution of the required cement dosage. The rotary mixing depth during construction should not be less than the specified depth of treatment and should be no more than one (1) inch deeper than the specified treatment depth.

Prior to paving operations, the pavement areas should be re-rolled (using a vibratory compactor) within about 1 to 2 days after compaction to minimize the potential for development of shrinkage cracks within the treated subbase. The purpose of re-rolling the surface of the treated subbase is to "micro-fracture" the surface of the subbase materials, whereby a significant amount of "small" cracks are produced instead of rather large "block" cracking. This operation shall be performed prior to application of the prime coat, if applicable.

The moisture content and density within the completed treated subgrade shall be maintained during construction.

## **6.7 Guidelines for Concrete Paving**

### **6.7.1 Characteristic of Concrete**

1. Portland cement concrete pavement shall be designed in accordance with Item 360, Class P, issued by the Texas Department of Transportation, Standard Specification for Construction and Maintenance of Highways, Streets and Bridges, 2014 Edition. All concrete shall have a minimum 7-day compressive strength of 3,200 psi and a minimum 28-day compressive strength of 4,000 psi. **In order to provide sufficient aggregate interlock within the concrete pavement, all coarse aggregate shall consist of crushed stone.** Concrete should be manufactured and delivered in accordance with ASTM C-94; Standard Specification for ready-mixed concrete.
2. Two to six percent air should be entrained in the concrete.
3. The maximum coarse aggregate size should not be greater than one-fourth the slab depth.
4. One set of four (4) concrete test cylinders shall be cast along with one air test and one slump test per every 60 cubic yards or less, for each day's placement and shall be tested for compressive strength as indicated below. One (1) concrete test cylinder shall be tested 7 days after placement, while two (2) concrete test cylinders shall be tested 28 days after placement. One (1) concrete test cylinder shall be held (not tested), unless required for confirmation (verification) of companion 28-day concrete compressive strength results (within ASTM standards of acceptable test results for companion cylinders).

### **6.7.2 Joints**

1. Control joints or contraction joints should be sawed, hand-formed or formed by premolded filler at maximum 15 foot center to center (12 foot centers are preferable). Joint depth should be equal to one-third of the slab thickness (D/3). Hand-formed joints should have a maximum edge radius of one-fourth inch. Sawing of joints should begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling (typically 4 to 12 hours after placement). All joints should be completed before uncontrolled shrinkage cracking occurs. Joints should be continuous across the slab unless interrupted by full

depth premolded joint filler, and should extend completely through the curb. All joint openings shall be cleaned and sealed before opening to traffic.

2. Expansion joints or isolation joints should be used to isolate fixed objects abutting or within the paved area. They should contain premolded joint filler for the full depth of the slab and should be sealed prior to opening to traffic.
3. In order to minimize rain water infiltration through the pavement surface into the underlying subgrade soils, all cracks and joints should be sealed at the time of construction and on a routine basis (maintained) for the life of the pavement.
4. The utilization of an integral curb is recommended.

### **6.8 Quality Assurance**

1. The suitability of on-site and/or off-site fill materials and asphalt materials should be verified by laboratory testing prior to installation at the jobsite.
2. The Moisture-Density Relationship (Proctor curves) of each material type should be determined prior to compaction. Such tests typically require at least three (3) to four (4) days to complete.
3. Pulverization (field gradation) tests should be performed on the treated subgrade soils at the rate of at least one test per 1,000 square yards of surface area or a minimum of three (3) tests per construction area, whichever is greater.
4. In-place (nuclear) density tests (ASTM D6938) should be performed on pavement fill and/or treated subgrade at the rate of at least one test per 1,000 square yards of surface area for each lift or a minimum of three (3) tests per construction area per lift, whichever is greater.

At each in-place density test location performed on the treated subgrade soils, a representative sample of the treated subgrade soils shall be obtained and laboratory oven dried moisture content tests (ASTM D2216) performed to determine the moisture content of the subgrade soils. The dry density values used for evaluating compaction levels (percent density) shall be calculated based on the wet density values determined in the field in accordance with ASTM D6938 (nuclear method) and the oven dried moisture contents determined in the laboratory in accordance with ASTM D2216.

Compliance with compaction specifications should be required prior to the placement of additional lifts.

5. After fine grading, verify thickness of the treated subgrade soils at the rate of at least one test per 1,000 square yards of surface area or a minimum of three (3) tests per construction area, whichever is greater.
6. One set of four (4) concrete test cylinders shall be cast along with one air test and one slump test per every 60 cubic yards or less, for each day's placement and shall be tested for compressive strength as indicated below. One (1) concrete test cylinder shall be tested 7 days after placement, while two (2) concrete test cylinders shall be tested 28 days after placement. One (1) concrete test cylinder shall be held (not tested), unless

required for confirmation (verification) of companion 28-day concrete compressive strength results (within ASTM standards of acceptable test results for companion cylinders).

## **6.9 Construction Considerations**

Relatively loose sandy fill soils are present at the site. During periods of rainfall, water has the potential of entering the subgrade and causing a “pumping” condition. The contractor shall grade the site to prevent water from ponding. In the event that a pumping subgrade is encountered, the contractor shall be prepared to overexcavate the pumping soil or chemically treat the soil by using cement or fly-ash in an effort to dry the soil.

## **7. INSPECTION AND TESTING**

Many problems can be avoided or solved in the field if proper inspection and testing services are provided. It is recommended that all site and subgrade preparation, proofrolling, fill placement, subgrade treatment, and pavement construction be monitored by a qualified engineering technician. Density tests should be performed to verify compaction and moisture content of all earthwork. Inspection should be performed prior to and during concrete placement operations. Alliance Geotechnical Group, Inc. employs a group of experienced, well-trained technicians for inspection and construction materials testing. We would be pleased to assist on this project phase.

## **8. LIMITATIONS**

The professional services, which have been performed, the findings obtained, and the recommendations prepared were accomplished in accordance with currently accepted geotechnical engineering principles and practices. Although our field personnel visually survey the site for surface features indicative of variable soil conditions, the possibility always exists that the subsurface conditions at the site may vary somewhat from those encountered in the boreholes. The number and spacing of test borings were chosen in such a manner as to decrease the possibility of undiscovered abnormalities, while considering the nature of loading, size, and cost of the project. If there are any unusual conditions differing significantly from those described herein, Alliance Geotechnical Group, Inc. should be notified immediately so that the effects of these conditions on design and construction can be addressed.

This study was conducted for the exclusive use of Johnson & Pace Incorporated, the City of Longview, Texas, and their design consultants. The reproduction of this report or any part thereof, in plans or other documents supplied to persons other than the owner, should bear language indicating that the information contained therein is for general design purposes. All contractors referring to this geotechnical report should draw their own conclusions for bidding purposes. This report is intended to guide preparation of project specifications and should not be used as a substitute for the project specifications.

We will retain the samples acquired for this project for a period of 60 days subsequent to the submittal date printed on the report. After this period, the samples will be discarded unless otherwise notified by the client in writing.

**ILLUSTRATIONS**



TBPE Firm #1970  
 317 W. Harrison Road  
 Longview, Texas 75604  
 (903) 759-5395

**Phase I Improvements  
 Longview Multimodal  
 Transportation Center  
 City of Longview, Texas**

**PLAN OF BORINGS**

Scale:  
 As Shown

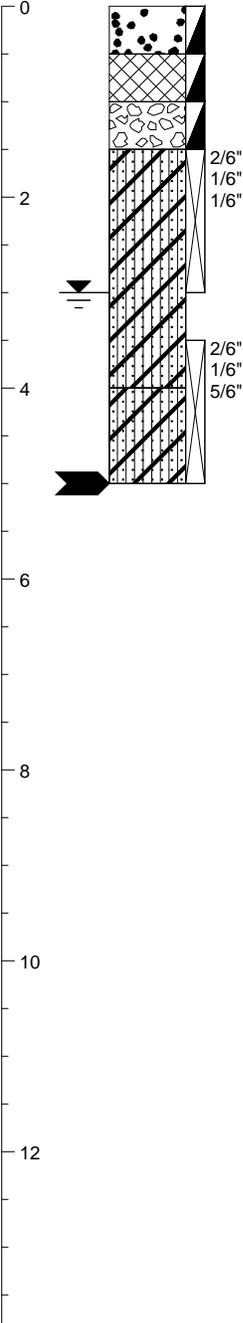
Project No.:  
 LE15-018

**FIGURE  
 NO.  
 1**

# LOG OF BORING BORING B-1

Project: **Phase I Improvements - Longview Multimodal Transportation Center**  
 Project No.: **LE15-018**                      Surface Elev.: **Existing**                      Date Drilled: **6-26-15**  
 Location: **See Plan of Borings - Figure 1**    Northing: **N/A**                      Easting: **N/A**  
 Depth to water at completion of boring: **3'**  
 Depth to water when checked: **@ Completion**                      was: **3'**  
 Depth to caving when checked: **@ Completion**                      was: **5'**

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI	-200 %	D.D. pcf	P.PEN tsf	UNCON. tsf
0		6"± Crushed Stone Base								
		6"± Mixture of Crushed Concrete, Brick Fragments & Oiled Dirt								
		6"± Deteriorated Concrete Pavement / Possible Cement Treated Base (HARD)								
2	2/6" 1/6" 1/6"	Soft brown silty sandy CLAY (wet)	21	27	13	14	61			
		-seepage @ 4' (FILL)                      (CL)								
4	2/6" 1/6" 5/6"	Medium stiff light gray & reddish brown silty sandy CLAY w/ occasional ironstone fragments                      (CL)	21	45	15	30	59			
6										
8										
10										
12										



Notes: Completion Depth: 5'  
 Boring Backfilled with Soil Cuttings and Tamped Upon Completion.

FIGURE NO.: 2

## LOG OF BORING BORING B-2

Project: **Phase I Improvements - Longview Multimodal Transportation Center**  
 Project No.: **LE15-018**                      Surface Elev.: **Existing**                      Date Drilled: **6-26-15**  
 Location: **See Plan of Borings - Figure 1**    Northing: **N/A**                      Easting: **N/A**  
 Depth to water at completion of boring: **Dry**  
 Depth to water when checked: **@ Completion**                      was: **Dry**  
 Depth to caving when checked: **@ Completion**                      was: **5'**

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI	-200 %	D.D. pcf	P.PEN tsf	UNCON. tsf	
0		6"± Portland Cement Concrete Pavement									
		3"± Oiled Dirt w/ some Gravel									
2		Loose brown & light brown silty clayey SAND (FILL)                      (SC)	14	18	12	6	43				
		Medium stiff to stiff dark gray & dark brown CLAY (CH)	27	75	18	57	82				
4	Stiff gray & reddish brown CLAY w/ iron stains (CH)	22	67	18	49	81					
6											
8											
10											
12											

Notes: Completion Depth: 5'  
 Boring Backfilled with Soil Cuttings, Tamped, and the Surface Patched Upon Completion.

FIGURE NO.: 3

## KEY TO LOG TERMS & SYMBOLS

Symbol Description

Symbol Description

### Strata symbols



Crushed Stone Base



FILL



Portland Cement Concrete Pavement Section



silty sandy CLAY



silty clayey SAND



CLAY

### Misc. Symbols



Depth to water at completion of boring



Depth to caving when checked



Depth to water when checked

### Soil Samplers



Bulk sample taken from flight auger



Standard Penetration Test (SPT)



Pavement Core w/ Diamond Tipped Core Barrel

### Notes:

1. Exploratory borings were drilled on dates indicated using standard truck-mounted drilling equipment.
2. Water level observations are noted on boring logs.
3. Results of laboratory tests conducted on samples recovered are reported on the boring logs.  
Abbreviations used are:

MC = natural moisture content (%)

LL = liquid limit (%)

PL = plastic limit (%)

PI = plasticity index (%)

-200 = percent fines passing the #200 sieve (%)

D.D. = dry unit weight (pcf)

P.Pen. = hand penetrometer (tsf)

UNCON. = unconfined compression (tsf)

NP = Non-Plastic (PI=0)

W = Weight of Drill Rods & Hammer

FIGURE NO.: 4

**APPENDIX A**

**TRAFFIC DATA (COUNTS) PROVIDED BY THE CITY OF LONGVIEW  
AND BUS TRAFFIC DATA PROVIDED BY PINE TREE ISD TRANSPORTATION**

**TABLE A**  
**SUMMARY OF TRAFFIC DATA (COUNTS)**  
**PROVIDED BY THE CITY OF LONGVIEW**

**PHASE I IMPROVEMENTS**  
**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**  
**CITY OF LONGVIEW, TEXAS**  
**AGG REPORT NO. LE15-018**

Location: Pacific Avenue  
 Cross Street(s): at Mobberly Avenue

	Total VPD	Cars Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<5 Axle Multi	6 Axle Multi	>6 Axle Multi
West Bound:	279	185	82	0	11	0	0	1	0	0	0	0	0
East Bound:	260	148	80	0	32	0	0	0	0	0	0	0	0
Design (ADT):	185	185	82	6	32	0	0	1	0	0	0	0	0
FHWA Veh. Class.	2	2	3	4	5	6	7	8	9	10	11	12	13
Axles <sup>(1)</sup>	1/1	1/1	1/1	1/2	1/1	1/2	1/3	1/1/2	1/2/2	1/2/3	1/1/1/1/1	1/1/2/1/1	1/2/2/1/1
Axle Loads (kips)	2/2	20/34	2/5	13.2/23	Max. <sup>(2)</sup>								

<sup>(1)</sup> 1 - Single Axles; 2 - Tandem Axles; 3 - Tridem (3) Axles  
<sup>(2)</sup> Maximum Axle Loads (excluding drive axle): 1 - Single Axles = 20 kips; 2 - Tandem Axles = 34 kips; 3 - Tridem (3) Axles = 42 kips  
<sup>(3)</sup> Maximum Drive Axle (Single Axle) Load for above <sup>(2)</sup> = 12 kips

**NOTE:** Traffic data summarized above (excluding Bus Traffic data) consists of the City of Longview traffic counts obtained on Tuesday, 7/21/15 (City of Longview traffic counts obtained on Tuesday, 7/21/15 indicated 0 (no) Bus Traffic). Therefore, since these facilities house the Greyhound Bus Station, the Bus Traffic data indicated above was developed by AGG. It is assumed that the City of Longview Transportaton (COLT) bus traffic is shown as FHWA Vehicle Classification 5 (2 Axle, 6 Tire).



Description 1:  
 Description 2:  
 Description 3:

Pacific Ave. WB  
 at Mobberly

Site:  
 Date:

000000000000  
 7/21/2015  
 Tuesday

24 Hour Vehicle Classification  
 Channel: Lane Flow

Time	Total	Bike	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi
12:00 PM	25	0	16	8	0	1	0	0	0	0	0	0	0	0
1:00 PM	22	0	15	5	0	2	0	0	0	0	0	0	0	0
2:00 PM	20	0	14	6	0	0	0	0	0	0	0	0	0	0
3:00 PM	20	0	9	11	0	0	0	0	0	0	0	0	0	0
4:00 PM	18	0	11	7	0	0	0	0	0	0	0	0	0	0
5:00 PM	19	0	11	6	0	2	0	0	0	0	0	0	0	0
6:00 PM	19	0	14	4	0	1	0	0	0	0	0	0	0	0
7:00 PM	9	0	5	2	0	2	0	0	0	0	0	0	0	0
8:00 PM	8	0	6	2	0	0	0	0	0	0	0	0	0	0
9:00 PM	7	0	4	3	0	0	0	0	0	0	0	0	0	0
10:00 PM	7	0	6	0	0	1	0	0	0	0	0	0	0	0
11:00 PM	5	0	4	0	0	1	0	0	0	0	0	0	0	0
7/22/2015														
12:00 AM	1	0	1	0	0	0	0	0	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	1	0	1	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	5	0	2	2	0	0	0	0	0	0	0	0	0	0
6:00 AM	3	0	3	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	10	0	6	4	0	0	0	0	0	0	0	0	0	0
8:00 AM	18	0	13	5	0	0	0	0	0	0	0	0	0	0
9:00 AM	14	0	11	3	0	0	0	0	0	0	0	0	0	0
10:00 AM	22	0	16	5	0	1	0	0	0	0	0	0	0	0
11:00 AM	26	0	17	9	0	0	0	0	0	0	0	0	0	0
Total	279	0	185	82	0	11	0	0	1	0	0	0	0	0
%		0.0	66.3	29.4	0.0	3.9	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0

## **APPENDIX B**

### **AASHTO PAVEMENT ANALYSES AND DESIGN STUDIES**

**AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES (1993),  
USING THE COMPUTER PROGRAM  
'PAVEMENT ANALYSES SOFTWARE (PAS)',  
PUBLISHED BY THE AMERICAN CONCRETE PAVEMENT ASSOCIATION**

**TABLE B**  
**SUMMARY OF AXLE LOADING CONDITIONS**

**PHASE I IMPROVEMENTS**  
**LONGVIEW MULTIMODAL TRANSPORTATION CENTER**  
**CITY OF LONGVIEW, TEXAS**  
**AGG REPORT NO. LE15-018**

Location: Pacific Avenue  
at Mobberly Avenue

FHWA Vehicle Classification No.	Average Daily Traffic (Design Lane) (ADT)	Assumed Traffic Application (No. of Days Per Week)	Number of Axle Loads (Weekly)														
			Single Axles (kips)										Tandem Axles (kips)	Tridem Axles (kips)			
			2	5	12	13.2	20	23	34	42	224	0					
2	185	7	2,590	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3	82	7	574	574	---	---	---	---	---	---	---	---	---	---	---	---	---
4	6	7	---	---	---	---	---	---	42	---	---	---	---	---	---	---	---
5	32	7	---	---	---	---	224	---	---	---	224	---	---	---	---	---	---
6	0	7	---	---	0	---	---	---	---	---	---	0	---	---	---	---	---
7	0	7	---	---	0	---	---	---	---	---	---	---	---	---	---	---	0
8	1	7	---	---	7	---	---	---	7	---	---	---	---	---	---	---	---
9	0	7	---	---	0	---	---	---	---	---	---	---	---	---	---	---	---
10	0	7	---	---	0	---	---	---	---	---	---	---	---	---	---	---	0
11	0	7	---	---	0	---	---	---	0	---	---	---	---	---	---	---	---
12	0	7	---	---	0	---	---	---	0	---	---	---	---	---	---	---	---
13	0	7	---	---	0	---	---	---	0	---	---	---	---	---	---	---	---
Total Axles Per Week (Design Lane):			3,164	574	7	224	11,648	2,548	49	224	11,648	2,548	49	224	11,648	2,548	0
<b>Total (Average) Axles First Year<sup>(1)</sup>:</b>			<b>164,528</b>	<b>29,848</b>	<b>364</b>	<b>11,648</b>	<b>11,648</b>	<b>2,548</b>	<b>2,548</b>	<b>11,648</b>	<b>11,648</b>	<b>2,548</b>	<b>2,548</b>	<b>11,648</b>	<b>11,648</b>	<b>2,548</b>	<b>0</b>

<sup>(1)</sup> Assumes Average Daily Traffic (Design Lane) Loading Conditions and Assumed Traffic Application (Number of Days Per Week) for 52 Weeks Per Year.

08-03-2015

State: Texas  
Agency: City of Longview, TX  
Company: AGG  
Contractor:  
Engineer: Terry W. Oswald, P.E.

Job Number: LE15-018  
Location: Phase I Improvements  
Longview Multimodal  
Transportation Center

===== Traffic Conversion To E 18's =====

E 18 CONVERSION FROM AXLE DATA

Estimated: Rigid Depth = 8.20    Structural Number = 0.00    Pt = 2.25  
Annual Growth Rate = 1.00  
Design Life = 20.00

Input Number	Axle Type	Axle Weight	Annual Number	Rigid E 18's	Flexible E 18's
1	1	2.00	164,528	738	0
2	1	5.00	29,848	3,294	0
3	1	12.00	364	1,423	0
4	1	13.20	11,648	68,316	0
5	1	20.00	2,548	87,594	0
6	1	23.00	11,648	717,553	0
7	2	34.00	2,548	107,066	0
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
Sum =				985,984	0

=====  
Key: 1-Single 2-Tandem 3-Tridem  
=====

08-03-2015

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Engineer: Terry W. Oswald, P.E.

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Longview Multimodal  
Transportation Center

===== Rigid Analysis =====

Pavement Depth	=	8.20	inches
Design E 18's	=	985,984	
Reliability	=	85.00	percent
Overall Deviation	=	0.35	
Modulus of Rupture	=	500.0	psi
Modulus of Elasticity	=	3,375,000	psi
Load Transfer, J	=	3.20	
Mod. of Subgrade Reaction	=	100	psi/in
Drainage Coefficient	=	0.90	
Initial Serviceability	=	4.50	
Terminal Serviceability	=	2.25	

For k determination:

- Resilient Mod. Subgrade	=	0	psi
- Resilient Mod. Base	=	0	psi
- Base Thickness	=	0.0	inches
- Depth to Rigid Foundation	=	i	> 10 feet
- Loss of Support Value	=	0	



08-03-2015

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Longview Multimodal  
Transportation Center

===== Rigid Analysis =====

Pavement Depth	=	8.84	inches
Design E 18's	=	1,578,200	
Reliability	=	85.00	percent
Overall Deviation	=	0.35	
Modulus of Rupture	=	500.0	psi
Modulus of Elasticity	=	3,375,000	psi
Load Transfer, J	=	3.20	
Mod. of Subgrade Reaction	=	100	psi/in
Drainage Coefficient	=	0.90	
Initial Serviceability	=	4.50	
Terminal Serviceability	=	2.25	
For k determination:			
- Resilient Mod. Subgrade	=	0	psi
- Resilient Mod. Base	=	0	psi
- Base Thickness	=	0.0	inches
- Depth to Rigid Foundation	=	i	> 10 feet
- Loss of Support Value	=	0	

08-03-2015

State: Texas  
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Job Number: LE15-018  
Location: Phase I Improvements  
Longview Multimodal  
Transportation Center

===== Traffic Conversion To E 18's =====

E 18 CONVERSION FROM AXLE DATA

Estimated: Rigid Depth = 9.10    Structural Number = 0.00    Pt = 2.25  
Annual Growth Rate = 1.00  
Design Life = 35.00

Input Number	Axle Type	Axle Weight	Annual Number	Rigid E 18's	Flexible E 18's
1	1	2.00	164,528	1,376	0
2	1	5.00	29,848	6,138	0
3	1	12.00	364	2,659	0
4	1	13.20	11,648	127,776	0
5	1	20.00	2,548	167,058	0
6	1	23.00	11,648	1,387,665	0
7	2	34.00	2,548	205,615	0
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
Sum =				1,898,286	0

Key: 1-Single 2-Tandem 3-Tridem

08-03-2015

State: Texas  
Agency: City of Longview, TX  
Company: AGG  
Contractor:  
Engineer: Terry W. Oswald, P.E.

Job Number: LE15-018  
Location: Phase I Improvements  
Longview Multimodal  
Transportation Center

===== Rigid Analysis =====

Pavement Depth	=	9.10	inches
Design E 18's	=	1,898,286	
Reliability	=	85.00	percent
Overall Deviation	=	0.35	
Modulus of Rupture	=	500.0	psi
Modulus of Elasticity	=	3,375,000	psi
Load Transfer, J	=	3.20	
Mod. of Subgrade Reaction	=	100	psi/in
Drainage Coefficient	=	0.90	
Initial Serviceability	=	4.50	
Terminal Serviceability	=	2.25	

For k determination:

- Resilient Mod. Subgrade	=	0	psi
- Resilient Mod. Base	=	0	psi
- Base Thickness	=	0.0	inches
- Depth to Rigid Foundation	=	i	> 10 feet
- Loss of Support Value	=	0	