

# ***THE GREEN***

## City of Longview, Texas



TPWD Project #50-000465

2017

**MHS Planning & Design, LLC**  
**212 West 9<sup>th</sup> Street**  
**Tyler, Texas 75701**  
903-597-6606

mhs@mhsplanning.com

CONTRACT DOCUMENTS AND  
TECHNICAL SPECIFICATIONS  
FOR

**THE GREEN**  
CITY OF LONGVIEW  
CONSTRUCTION PROJECT  
MHS PROJECT #15-026  
TPWD PROJECT #50-000465

FEBRUARY 2017



PREPARED BY:

**MHS**  
PLANNING & DESIGN, LLC

TBPE FIRM REGISTRATION NO. F-14571

212 WEST 9<sup>TH</sup> STREET – TYLER, TEXAS – 903.597.6606 – MHS@MHSPLANNING.COM

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## **ADVERTISEMENT FOR BIDS**

The City of Longview will receive sealed proposals for the construction of THE GREEN improvements under the Texas Parks & Wildlife Local Assistance Program TPWD#50-000465. Bids are to be addressed to: Rolin McPhee, P.E., Director of Public Works, City of Longview, Texas, Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604, and are to be received until 2 p.m., Friday, March 31, 2017. The bid is for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of The Green in Longview, Texas, in accordance with the specifications on file at the Public Works Service Center, 933 Mobile Drive, Longview, Texas 75604 and MHS Planning & Design, LLC, 212 W. 9<sup>th</sup> Street, Tyler, Texas 75701.

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.

Contract documents including bid proposal forms, plan sheets, and specifications for the project may be viewed and downloaded free of charge (with the option to purchase hard copies) at [www.civcastusa.com](http://www.civcastusa.com). The contract documents may be examined without charge at the office of MHS Planning & Design, LLC, 212 West 9<sup>th</sup> Street, Tyler, Texas.

A pre-bid meeting for all prospective bidders will be held at 10:30 a.m., Thursday, March 23, 2017, 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 THE GREEN**

**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. Friday March 31, 2017**, for furnishing all labor, materials, equipment, supplies, and supervision necessary for the construction of **THE GREEN**, in accordance with the plans and specifications on file at **MHS PLANNING & DESIGN, LLC**. 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 at [www.civcastusa.com](http://www.civcastusa.com) or electronic plans can be obtained by contacting **MHS PLANNING & DESIGN, LLC, 212 W. 9<sup>th</sup> Street, Tyler, Texas 75701 903-597-6606** [www.mhsplanning.com](http://www.mhsplanning.com).

**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 at **10:30 a.m., Thursday, March 23, 2017**, 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 **One Hundred & Eighty (180) 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  
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 \$650.00 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 MHS Planning & Design, LLC, 212 West 9<sup>th</sup> Street, Tyler, TX 75701, mhs@mhsplanning.com, 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 MHS Planning & Design, LLC (mhs@mhsplanning.com) 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 \$25,000.00 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. These laws and regulations will be deemed to be included in the Contract the same as though herein written out in full.

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

- (a) The contractor will not discriminate against any employee or applicant for employment because of race, religion, color gender, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, gender or national origin.
- (b) The contractor will, in all solicitations or advertisements for employees place by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, or national origin.
- (c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or worker's representative of the contractor's commitments under Section 202 of Executive Order No. 11246, as amended (3 CFR 169 (19740), and shall post copies of notices in conspicuous places available to employees and applicants for employment.
- (d) The contractor will comply with all provisions of Executive Order No. 11246, as amended, and by the rules, regulations, and order of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (e) The contractor will furnish all information and reports required by Executive Order No. 1124, as amended, and by the rules, regulations, and order of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and others.
- (f) In the event of the contractor's noncompliance with the non-discrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order No. 11246, as amended, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246, as amended, or by rule, regulations, or order of the Secretary of Labor or as otherwise provided by law.

- (g) The contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246, as amended, so that such provisions will be binding upon each subcontractor or vendor. The contract will take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing such provisions, including sanctions for noncompliance: provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interest of the United States.
  - (h) No official or employee of the state or local government who is authorized in his official capacity to negotiate, make, accept, or approve, or to take part in such decisions regarding a contract or subcontract in connection with this project shall have any financial or other personal interest in such contract
  - (i) No person performing services for the state or local government in connection with this project shall have a financial or other personal interest other than his employment or retention by the state or local government, in any contract or subcontract in connection with this project. No officer or employee of such interest is openly disclosed upon the public records of the state, and such officer, employee or person has not participated in the acquisition for or on behalf of the participant.
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.

**STATEMENT OF  
CONTRACTOR QUALIFICATIONS**

Firm Name: \_\_\_\_\_ Date Organized: \_\_\_\_\_  
 Partnership  Corporation

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Telephone Number (s): \_\_\_\_\_ Email: \_\_\_\_\_

Number of years in business under present name: \_\_\_\_\_

Former name(s) of organization: \_\_\_\_\_

<b>CLASSIFICATION:</b> <input type="checkbox"/> General <input type="checkbox"/> Building <input type="checkbox"/> Electrical <input type="checkbox"/> Plumbing <input type="checkbox"/> HVAC <input type="checkbox"/> Utilities <input type="checkbox"/> Earthwork <input type="checkbox"/> Paving <input type="checkbox"/> Other
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**1. LIST OF SIMILAR COMPLETED PROJECTS:**

Amount of Contract	Type of Work	Date Completed	Name & Telephone Number of Owner

**2. LIST OF SIMILAR PROJECTS UNDER CONSTRUCTION OR UNDER CONTRACT:**

Amount of Contract	Type of Work	Date Completed	Name & Telephone Number of Owner

**3. LIST SURETY BONDS IN FORCE ON ABOVE INCOMPLETE WORK (LIST 2):**

Amount of Contract	Type of Work	Date Completed	Name & Telephone Number of Owner

**4. LIST CONSTRUCTION SUPERINTENDENT'S NAME AND CONSTRUCTION EXPERIENCE:**


**CITY OF LONGVIEW  
PUBLIC WORKS DEPARTMENT**

CERTIFICATE OF FINAL COMPLETION OF: THE GREEN

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 a 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.

\_\_\_\_\_  
Inspector

\_\_\_\_\_  
Project Consulting Engineer

# Liquidated Damages Calculation

PROJECT The Green  
 C.I.P. PROJECT NO. \_\_\_\_\_ PROJECT MANAGER Alton Bradley  
 CONTRACT NO. \_\_\_\_\_ PROJECT SPONSOR \_\_\_\_\_  
 PREPARED BY Alton Bradley DATE 2/1/2017

## ON-SITE PROJECT INSPECTION (CITY FORCES)

Engineer/Architect.....	<u>8</u>	hr/wk @	<u>\$60.00</u>	/hr =	<u>\$480.00</u>	/wk (+7) =	<u>\$68.57</u>	/day
Supervising Inspector.....	<u>40</u>	hr/wk @	<u>\$32.00</u>	/hr =	<u>\$1,280.00</u>	/wk (+7) =	<u>\$182.86</u>	/day
Inspector.....	<u>16</u>	hr/wk @	<u>\$27.00</u>	/hr =	<u>\$432.00</u>	/wk (+7) =	<u>\$61.71</u>	/day
							Sub-Total =	<u>\$313.14</u> /day
Overhead: _____ % of Sub-Total.....							=	<u>\$313.14</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>\$130.00</u>	/hr =	<u>\$1,040.00</u>	/wk (+7) =	<u>\$148.57</u>	/day
Technician (Private Sector).....	<u>0</u>	hr/wk @	<u>\$0.00</u>	/hr =	<u>\$0.00</u>	/wk (+7) =	<u>\$0.00</u>	/day

## Project Management

Project Manager (City).....	<u>6</u>	hr/wk @	<u>\$60.00</u>	/hr =	<u>\$360.00</u>	/wk (+7) =	<u>\$51.43</u>	/day
Technician (City).....	<u>8</u>	hr/wk @	<u>\$30.00</u>	/hr =	<u>\$240.00</u>	/wk (+7) =	<u>\$34.29</u>	/day
							Sub-Total =	<u>\$85.71</u> /day
Overhead: <u>.00</u> % of Sub-Total.....							=	<u>\$85.71</u> /day

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

Assuming 80% paid @ completion date:

Construction Cost.....					<u>\$1,200,000.00</u>
Total Paid (80%).....					<u>\$960,000.00</u>
Daily Interest @ 0.0110 % of Total Paid: (or <u>4</u> % annual interest rate):.....					<u>\$105.60</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>\$653.03</u>
				<b>USE</b>	<u><b>\$650.00</b></u>

**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**

### **Certificate of Interested Parties (Form 1295)**

In 2015, the Texas Legislature adopted House Bill 1295, which added Section 2252.908 of the Government Code. The law states that a governmental entity may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity. The disclosure of interested parties will be submitted online via Form 1295 and must be submitted to the governmental entity prior to any signed contract and/or vote by the governing authority.

#### **The Filing Process:**

1. Prior to award by City Council, your firm will be required to log in to the Texas Ethics Commission, [https://www.ethics.state.tx.us/whatsnew/elf\\_info\\_form1295.htm](https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm) and fill out the Electronic Filing Application.
2. Once submitted, the system will generate an electronic Form 1295 displaying a "Certificate Number." Your firm must print, sign and notarize Form 1295.
3. **Within seven (7) business days** from notification of pending award by the City of Longview Purchasing Department, the completed Form 1295 **must** be submitted to City of Longview.
4. Your firm will need to repeat this process and obtain a separate Form 1295 each time you enter into a new contract, renew a contract or make modification and/or amendments to a City of Longview contract.

Instructions and information are available at <https://www/ethics.state.tx.us/tec/1295-Info.htm> or you may call the Texas Ethics Commission at (512) 463-5800.

**BY SUBMITTING A BID YOUR FIRM AGREES TO ADHERE TO HB 1295 REFERENCED ABOVE**

**Please Note: No action required until notification of potential award by the City of Longview Purchasing Department.**

# CERTIFICATE OF INTERESTED PARTIES

# FORM 1295

## OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.  
 Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

**1 Name of business entity filing form, and the city, state and country of the business entity's place of business.**

**2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.**

**3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.**

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

**5 Check only if there is NO Interested Party.**

**6 AFFIDAVIT** I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

\_\_\_\_\_  
 Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said \_\_\_\_\_, this the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_, to certify which, witness my hand and seal of office.

\_\_\_\_\_  
 Signature of officer administering oath      Printed name of officer administering oath      Title of officer administering oath

**ADD ADDITIONAL PAGES AS NECESSARY**

# PROPOSAL

**CITY OF LONGVIEW  
PUBLIC WORKS SERVICE CENTER  
933 MOBILE DRIVE  
LONGVIEW, TX 75604  
THE GREEN  
(INSERT TIME, DAY, DATE OF BID OPENING)**

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.

## BID PROPOSAL

**Client:** City of Longview, Texas  
**Project:** The Green  
**Description:** Park Construction

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
1	Lump Sum (L.S.)	Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>mobilize for the project</b> including but not limited to <b>project start-up, bonds &amp; insurance</b> in accordance with the plans and specifications, complete and in place for:  <div style="text-align: right;">_____ Dollars</div> <div style="text-align: right;">_____ Cents</div>		
2	1 Each (E.A.)	Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to construct the <b>temporary construction sign</b> , according to the plans and specifications complete and in place for:  <div style="text-align: right;">_____ Dollars</div> <div style="text-align: right;">_____ Cents</div>		
3	L.S.	Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to provide the <b>SWPPP Plan</b> and install and maintain the <b>storm water pollution prevention &amp; erosion control</b> per City of Longview and TCEQ requirements elements including but not limited to silt fencing and all reporting according to the plans and specifications, complete and in place for:  <div style="text-align: right;">_____ Dollars</div> <div style="text-align: right;">_____ Cents</div>		
4	200 Linear Feet (L.F.)	Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to provide and install <b>temporary tree protection</b> , according to the plans and specifications complete and in place for:  <div style="text-align: right;">_____ Dollars</div> <div style="text-align: right;">_____ Cents</div>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
5	1,535 Square Feet (SQ.FT.)	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to provide and install <b>4" stone rip rap</b> including the construction entrance according to the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
6	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to <b>clear &amp; grub the site</b>, including, but not limited to tree removal &amp; disposal and grubbing according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
7	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to <b>perform site grading</b>, including, but not limited to excavation, stockpiling topsoil, backfill, compaction, pond excavation &amp; grading for the improvements and surrounds according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
8	676 Cubic Yards (CU.YD.)	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to <b>export excess topsoil approximately 2 miles from site</b>, including, but not limited to loading and hauling material, according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
9	414 L.F.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>2" HDPE Endotrace water lines</b> including but not limited to excavation, pipes, fittings and valves in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
10	258 L.F.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>1" HDPE water lines</b> including but not limited to excavation, pipes, hose bibs, fittings and valves in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
11	1 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install <b>backflow preventers</b> including but not limited to excavation, concrete blocking, pipes and meter box in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
12	337 L.F.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>4" PVC sewer lines</b> including but not limited to excavation, pipes, cleanouts, fittings and connection to existing sewer line in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
13	1 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to construct the <b>entry sign</b>, including but not limited to foundation, concrete blocks, hardie board veneer and aluminum lettering according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
14	1 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to construct the <b>bronze plaque</b> including but not limited to the plaque and boulder according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
15	1 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to construct the <b>donor plaque</b> including but not limited to the plaque and boulder according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
16	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to construct the <b>electrical system</b> including, but not limited to the service, distribution system, panels, conduit, wire, outlets and lights, in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
17	25,900 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct <b>5" thick reinforced concrete trails (8' wide)</b>, including but not limited to excavation, subgrade preparation, reinforcing steel and concrete in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
18	6 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct <b>6" thick reinforced concrete trail drains</b>, including but not limited to excavation, subgrade preparation, reinforcing steel and concrete in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
19	1,750 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>35' x 50' pavilion foundation</b> including but not limited to excavation, subgrade preparation, reinforcing steel and concrete foundation in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
20	3,786 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct <b>5" thick reinforced concrete plaza area</b>, including but not limited to excavation, subgrade preparation, reinforcing steel and concrete in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
21	17,695 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>6" thick reinforced concrete parking, entry drive &amp; entry walk</b> including but not limited to excavation, stabilized subgrade, reinforcing steel, concrete and 6" curb and gutter in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
22	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>parking lot and trail striping &amp; parking lot signage</b> including but not limited to lane striping, handicapped accessible striping, trail crossing striping, handicapped accessible signs &amp; pedestrian signs in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
23	130 L.F.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>12" wide x 12" deep reinforced concrete border</b> at the outdoor education area including but not limited to excavation, subgrade preparation, reinforcing steel and concrete accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
24	1,626 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>decomposed granite pad</b> at the outdoor education node including but not limited to excavation, subgrade preparation, limestone base and decomposed granite in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
25	5 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to install <b>park benches (provided by Keep Longview Beautiful)</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
26	7 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install <b>trash receptacles</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
27	1 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and construct the <b>35' x 50' pavilion</b> including but not limited to the structure, in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
28	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>nature play area</b> including but not limited to the custom log climber and tortoise in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
29	180 L.F.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>8" dia. cedar log playground border</b> including but not limited to the logs, beveling and rebar in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
30	80 CU.YD.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>engineered wood fiber safety surface</b> in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
31	160 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>8' wide x 20' long bridge</b> including but not limited to piers, Trex decking and toe catches in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
32	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to install the <b>8' x 8' concrete panels</b> (provided by Keep Longview Beautiful) at the music play area including but not limited to excavation, subgrade preparation, installation of the concrete panels, easing the concrete panel edges, and river rocks in accordance with the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
33	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>musical play instruments</b> at the music play area in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
34	6 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install <b>12" dia. x 4' long vertical cedar log steppers</b> in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
35	6 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install all <b>10" dia. x 4' long vertical cedar log steppers</b> in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
36	5 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary to install the <b>vertical stone signs</b> (provided by Keep Longview Beautiful), according to the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
37	300 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>gravel foundation &amp; rough-in plumbing for the CXT restroom building</b> including but not limited to excavation, subgrade preparation and gravel foundation, in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
38	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the <b>CXT restroom building</b> including but not limited to the building, installation and utility (water, sewer and electrical) connections in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
39	815 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to install the <b>brick pavers</b> (provided by Keep Longview Beautiful) at the parking lot area including but not limited to excavation, subgrade preparation, limestone base, grout, concrete pavers and sand in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		
40	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to construct the automatic <b>irrigation system</b> including but not limited to controller, mainline, valves, lateral lines and heads in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____ Dollars</p> <p style="text-align: right;">_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
41	45,000 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary for <b>grassing around the pavilion area</b> including, but not limited to grass seed, lime, fertilizer, and grow-in according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
42	4,100 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary for <b>sodding</b> including, but not limited to sod, lime, fertilizer, and grow-in according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
43	70,805 SQ.FT.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary for <b>native seed grassing</b> including, but not limited to grass seed, lime, fertilizer, and grow-in according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
44	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials and any other requisite necessary for <b>native seed grassing all areas disturbed by construction</b> including, but not limited to grass seed, lime, fertilizer, and grow-in according to the plans and specifications complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		
45	28 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 3" cal. Loblolly Pine Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____ Dollars</p> <p>_____ Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
46	12 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 2" cal. Cedar Elm Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____Dollars</p> <p>_____Cents</p>		
47	2 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 2" cal. Bur Oak Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____Dollars</p> <p>_____Cents</p>		
48	15 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 2" cal. Shumard Oak Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____Dollars</p> <p>_____Cents</p>		
49	15 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 2" cal. Eastern Red Cedar Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____Dollars</p> <p>_____Cents</p>		
50	2 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to <b>plant 2" cal. Red Bud Trees</b> in accordance with the plans and specifications, complete and in place for:</p> <p>_____Dollars</p> <p>_____Cents</p>		

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
51	1 EA.	Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>interpretive sign</b> , including but not limited to the sign and pedestal in accordance with the plans and specifications, complete and in place for:  _____ Dollars _____ Cents		
52	1 EA.	Miscellaneous Allowance  _____ Dollars _____ Cents	\$50,000.00	\$50,000.00
<b>Total Bid</b>		\$ _____ _____ Dollars _____ Cents		

## BID ALTERNATES

Item #	Quantity/ Unit	Item Description & Written Price	Unit Price	Total
1	8 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and construct the <b>pavilion column veneer</b> including but not limited to concrete blocks, masonry and hardie board veneer in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____Dollars</p> <p style="text-align: right;">_____Cents</p>		
2	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to plant and grow-in the <b>bioswale (100 Swamp Milkweed plants and 100 Butterfly Weed plants)</b> in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____Dollars</p> <p style="text-align: right;">_____Cents</p>		
3	L.S.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install <b>twelve (12) boulders</b> (18" min - 36" max) in accordance with the plans and specifications complete and in place for:</p> <p style="text-align: right;">_____Dollars</p> <p style="text-align: right;">_____Cents</p>		
4	2 EA.	<p>Furnish all labor, tools, equipment, superintendence, materials, and any other requisite necessary to provide and install the <b>interpretive signs</b>, including but not limited to the sign and pedestal in accordance with the plans and specifications, complete and in place for:</p> <p style="text-align: right;">_____Dollars</p> <p style="text-align: right;">_____Cents</p>		

**Note:**

**Bid Alternates will be selected and awarded at the sole discretion of the City of Longview.**

**PROPOSAL: THE GREEN**

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 **180 consecutive calendar days**. The undersigned Bidder further agrees to pay, as liquidated damages, the sum of **\$650.00** 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 MHS Planning & Design 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)

## SEPARATION OF MATERIALS FORM

The successful Bidder shall prepare an itemized list of materials (including his prices to Owner) which are incorporated into the project and/or furnished to the Owner uninstalled. Consumable materials including motor fuel are excluded from this list.

This is a list of materials which, for sales tax purposes, are considered sold by the Contractor to the Owner who is a sales tax exempt entity. Such materials are thus exempt from any sales taxes, either on the Contractor's purchase of the materials for resale or on his resale to the Owner.

The level of detail in this breakdown is at the discretion of the Contractor, with the understanding that the Contractor is responsible for furnishing required documentation to the State Comptroller. Major material purchases should be included to ensure their tax exempt status.

Material quantities in this breakdown should be limited to the amounts reasonably necessary for completion of the project. Excess materials which are used on another project may become subject to sales tax if not properly documented.

The Contractor's material prices to the Owner must be no less than his purchase price and may include transportation and handling costs plus a reasonable profit.

The total material price in the required breakdown must equal the total material price listed below. The breakdown must be mathematically correct before it will be approved by the Engineer and incorporated into the contract documents as sales tax exempt.

The material price breakdown shall be submitted with this form before execution of the contract documents. Otherwise, the Contractor may risk losing his sales tax exemption for this project.

- |   |          |
|---|----------|
| 1. TOTAL CONTRACT AMOUNT  | \$ _____ |
| (As Awarded)  |          |
| 2. SALES TAX EXEMPT MATERIALS   | \$ _____ |
| (All materials which are (a) furnished by the Contractor and incorporated into completed project or (b) furnished uninstalled by Contractor to Owner) |          |
| 3. OTHER COSTS  |          |
| (Including installation and consumable materials) \$ _____  |          |

- Notes:
1. Line 1 = contract price as awarded.
  2. Line 2 + Line 3 must equal Line 1.
  3. Line 2 must be not less than Contractor's anticipated invoice price for all sales tax exempt materials.





**CERTIFICATE OF INSURANCE**

**To:**  
**City of Longview**  
**P O Box 1952**  
**Longview, TX 75601**

**Date:**  
**Project: The Green Construction**  
**Project #:**

**THIS IS TO CERTIFY THAT** \_\_\_\_\_  
**(Name and address of insured)**

Is, at the date of this certificate, insured by this Company with respect to the business operations hereinafter described, for the typed of Insurance and in accordance with the provisions of the standard policies used by this Company, and further hereinafter described. Exceptions to standard policy noted on reverse side hereof.

	Policy No.	Effective	Expires	Limits of Liability
Workmen's Compensation				
Public Liability				
Contingent Liability				
Property Damage				
Builder's Risk				
Automobile				
Other				

**The foregoing Policies (do) (do not) cover all sub-contractors.**

**Locations Covered:** \_\_\_\_\_

**Additional Secured:** \_\_\_\_\_

The above policies either in the body thereof or by appropriate endorsement provide that they may not be changed or cancelled by the insurer in less than five days after the insured has received written notice of such change or cancellation.

Where applicable local laws or regulations require more than five days actual notice of change or cancellation to the assured, the above policies contains such special requirements, either in the body thereof or by appropriate endorsement thereto attached.

\_\_\_\_\_  
(Name of Insurer)  
By: \_\_\_\_\_  
Title: \_\_\_\_\_

**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. 201\_, 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 \_\_\_\_\_, County of \_\_\_\_\_ 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:

**THE GREEN**

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 Arboretum and Nature 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 Addendum No.(s) \_\_\_\_, the Advertisement for Bids, Notice for Bidders, Information for Bidders, Statement of Qualifications, Certificate of Final Completion, Liquidated Damages Calculation, CONTRACTOR's Bid Proposal, Vendor Compliance to State Law, CIP Form 1295, Separation of Materials Form, Bid Bond, Certificate of Insurance, Standard Form of Agreement, Construction Performance Bond, Construction Payment Bond, Maintenance Bond, General Conditions of Agreement, Special Conditions of Agreement, Technical Specifications and Geotechnical Report. This agreement shall also include all Plans, Specifications & Drawings

for The Longview Arboretum and Nature 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 180 consecutive 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 Texas, 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 \_\_\_\_\_, 2017, to complete

**THE GREEN**

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 \_\_\_\_\_, 201\_.

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  
Texas, 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 \_\_\_\_\_,  
2017, to construct

THE GREEN

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 \_\_\_\_\_, 2017.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Surety

By \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

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:

THE GREEN

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 \_\_\_\_\_

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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.

## **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.

# **TECHNICAL SPECIFICATIONS**

# TECHNICAL SPECIFICATIONS INDEX

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## Section 102 Clearing & Grubbing

1. **Description.** "Clearing and Grubbing" shall consist of the removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish and other objectionable matter.
2. **Construction Methods.** Areas scheduled for clearing shall be cleared of stumps, brush, logs, rubbish, trees and shrubs, except such trees and shrubs and certain areas designated by the Consultant for preservation. Those trees, shrubs and other landscape features specifically designated by the Consultant for preservation shall be carefully protected from abuse, marring or damage during construction operations. Continual parking and/or servicing of equipment under the branches of trees designated for preservation will not be permitted. Trees and shrubs designated for preservation that must be pruned shall be trimmed as directed and all exposed cuts over 2 inches in diameter shall be treated with an approved material.

Areas required for embankment construction; for roadway, trails, channel and structural excavation; and for borrow sites and material sources shall be cleared and grubbed. On areas required for roadway, trail, channel, or structural excavation, all stumps, roots, etc., (except for designated trees and brush) shall be removed to a depth of at least 2 feet below the lower elevation of the excavation. On areas required for embankment construction, all stumps, roots, etc., (except for designated trees and brush) shall be removed to a depth of at least 2 feet below the existing ground surface. All holes remaining after clearing and grubbing shall be backfilled and tamped as directed by the Consultant and the entire area bladed to prevent ponding of water and to provide drainage, except, in areas to be immediately excavated, the Consultant may direct that the holes not be backfilled. When permitted by the plans, trees and stumps may be cut off as close to natural ground as practicable on areas which are to be covered by at least three feet of embankment. On areas required for borrow sites and material sources, stumps, roots, etc., (except for designated trees and shrubs) shall be removed to the complete extent necessary to prevent such objectionable matter becoming mixed with the material to be used in construction.

All cleared and grubbed material shall be disposed of in a manner satisfactory to the Consultant. Unless otherwise provided, all merchantable timber removed as required above shall become the property of the Contractor.

Cleared material shall be shredded, chipped, burned (if allowed by local ordinances), or hauled off site. Shredded or chipped material may be disposed of on the site as directed by the Consultant.

No timber shall be cut or defaced outside of the right of way lines, clearing limits, or material pit limits as indicated on the plans or by the Consultant.

3. **Measurement.** "Clearing and Grubbing" will be measured by the "lump sum" or by the 100-Foot Station" regardless of the width of the established right of way.

Measurement for payment will be made only on areas indicated and classified on plans as "Clearing and Grubbing", except that required work on additional areas (such as additional right of way, additional borrow and material sources, additional cut and embankment areas, etc.) Not originally proposed by plans but found necessary during construction, and which comes within the purview of "Clearing and Grubbing" as established on plans for the contract shall be measured accordingly.

Areas other than those set forth above will not be measured for payment.

4. **Payment.** All work performed and measured as provided under "Measurement" will be paid for as a lump sum price bid for "Clearing and Grubbing", which price shall be full compensation for furnishing all labor, equipment, tools, supplies, arranging for and providing disposal sites if disposed of by hauling off the project, and incidentals necessary to complete the work.

All work performed in clearing and grubbing areas not so designated on plans, except "additional areas" as defined under "Measurement", will not be paid for directly but shall be considered as subsidiary work pertaining to the various bid items.

END SECTION 102

**SECTION 163**  
**SEEDING - GENERAL**

1. DESCRIPTION: Provide all materials, labor and equipment to complete the work of this Section. Seeding shall consist of preparing ground to receive, fertilizing and seeding/mulching.
2. GENERAL: In all cases the guiding specifications shall be Horticultural Standards - American Association of Nurserymen, Inc. and shall be in compliance with FHA data sheet No. SP-251. Provide grass at all areas disturbed by construction, including at the street right-of-way.
3. MATERIALS:

- A. Grass Seed: All seed must meet the requirements of the Federal Seed Act and shall comply with the tolerances provided by this Act. The containers shall be labeled by the suppliers and shall show the percentages by weight of pure seed (minimum 97%), germination (minimum 85%) and weed seed maximum of 1%. See drawings or Job Specifics for seeded and/or sodded requirement.

Top soil physically identified either as existing soil, soil initially stripped, and respread, or soil imported to the site, shall be fertile and capable of improvement to permit a normal growth of grass. It shall be free of extraneous materials harmful to plant growth. The soil shall be tested by facilities located at a Land Grant College or by a private soil chemical testing laboratory. Soil tests shall show soil type according to the Unified Soil Classification System, reveal any deficiencies in plant food elements and organic matter, and any deficiency or excess in acidity or alkalinity. The soil shall be improved as recommended by the agency or as indicated by laboratory test.

- B. Lime and Fertilizers: These materials shall consist of commercial quality ground limestone and commercial chemical fertilizer containing stated ratios of nitrogen, phosphorous and potash. The latter shall be transported and stored in containers to insure proper protection and handling. Ratio of nitrogen, phosphorous, and potash nutrients shall be 1:1:1 per Consultant's instructions and applied at a rate of one half (0.5) pounds of nitrogen per one thousand (1000) square feet. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work will shall meet the approval of the Consultant. Additionally, add pelletized lime at the rate of two tons per acre.

4. PLANTING METHODS: GRASS

- A. Finish Grading: All areas which have been regraded or stripped of top soil shall be scarified, leveled and brought to an accurate subgrade. Stripped top soil or top soil imported for the seed bed shall be spread after subsoil fills are properly compacted, meeting the approved finish grade and shall be at least five inches deep when compacted.
  1. Perform fine grading within Contract limits, including adjacent transition areas, where required, to new elevations, levels, and contours indicated. Provide subgrade surfaces parallel to finished surface grades. Provide uniform levels and slopes.
  2. Grade surface to ensure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes. Provide subgrade surface free of exposed boulders or stones exceeding 2 inches in greatest dimension in lawn areas.
  3. Provide adequate drainage of the working area at all times.
  4. Fine grade soil eliminating rough and low areas to ensure positive drainage.

Maintain levels, profiles, and contours of subgrades.

5. Remove stones, roots, weeds, and debris while raking topsoil. Rake surface clean of stones 1 inch or larger in any dimension and of all debris.
6. Fire Ant Control - Fire ants shall be controlled with spot application of insecticide as necessary. Apply after dew has dried and when no rain is expected for 6 hours. Spot treat entire area of planting/grassing.

B. Preparation of Seed Bed: Where existing undistributed soil is satisfactory, the seed bed shall be prepared by plowing or scarifying to a depth of at least four inches, then harrowing and/or dragging thoroughly to smooth the surface. All weeds and competing grasses shall be eliminated by use of an approved herbicide prior to seeding. Where existing top soil is not acceptable for grass growth five inch minimum thickness of approved top soil shall be furnished and installed. Prevent erosion of the finish grading or ground surface. Top soil shall be harrowed or dragged to form a smooth seed bed.

C. Seeding:

1. The finish grading and preparation of the seed bed shall be free of birdbaths and be approved by the Consultant prior to seeding, hydroseeding or hydromulching.
2. Broadcast Seeding: The prepared seed bed shall be furrowed lightly with a rake, seed sown at the rate prescribed in these specifications or shown on the plans, then rolled with a hand or mechanical roller not exceeding 100 pounds of weight per foot of width. All seeded areas shall be sprinkled with a fine spray to avoid runoff of water and be adequately protected from foot or vehicular traffic during the period grass is being established.
- 3.. "Hydroseeding" or "Hydromulching": Mechanical hydroseeding (that is mixing seed, water, fertilizers, fiber mulch and tackifiers) shall be performed using specialized equipment made for spraying the seed mixture specified in the "Job Specific" portion of this section. The flow of water shall be regulated to provide a non-erosive spray rather than a high-impact jet of water which damages the prepared surface. Application of hydromulch shall be applied in accordance with SECTION 0167 - HYDROMULCHING, within this contract.

D. Maintenance and Acceptance: All seeded areas shall be watered and maintained until a thick stand of grass is established. After three to four weeks of favorable weather, bare spots shall be recultivated, reseeded, raked and rolled as in the original work. Maintenance, including mowing, shall continue until this work is accepted and approved by the Owner.

Grass will be acceptable after a minimum of four (4) mowings by the Contractor or on a date the entire project is substantially completed (whichever is later) and grass is healthy and weed-free with 95% coverage and no bare spots exceeding six inches in diameter.

E. Seasonal Limits: Seeding shall be done during the proper season when the soil is frost-free and during favorable seeding conditions. Bermuda grass seed shall not be planted prior to May 1<sup>st</sup> or after August 15<sup>th</sup> without written consent from the Consultant.

5. SOIL RETENTION BLANKETS: Soil retention blankets where shown on the plans shall be photodegradable or biodegradable excelsior blankets or woven paper mats commercially manufactured for installation on bare soils to protect construction areas from washing. Blankets shall be installed snugly over the area to be protected using six inch "U" shaped wire staples on 2'-0' centers along edges add at staggered 4'-0' spacing on the mat face. No gaps shall be left

between adjoining mats. Blankets shall be equal to AMXCO "Curlex" or Gulf States Paper Company's "Hold-Gro" woven paper mesh. Grass seed shall be planted in conjunction with all soil retention blankets.

6. MEASUREMENT AND PAYMENT: Payment for seeding shall be at the unit price bid for seeding which shall include surface preparation, furnishing and spreading seed either by broadcast or hydroseeding as specified elsewhere, grow-in, fertilization, and including soil retention blankets if shown on the plans.

END OF SECTION 163

**SECTION 164**  
**SEEDING - JOB SPECIFIC**

DESCRIPTION: Seeding shall consist of providing and planting Tex-Ace Bermuda grass seed (without hulls) on all areas disturbed on the project site not scheduled for sod or hydromulching, including watering and fertilizing.

CONSTRUCTION METHODS: Immediately prior to seeding the Contractor shall cross disk the areas to be seeded to a minimum depth of 4". The site shall then be dragged and rolled to a smooth surface and planted with Tex-Ace bermuda seed (without hulls). Bermuda seed shall be applied by whatever means the Contractor deems appropriate at a rate of not less than 130 pounds per acre. Seeds shall be evenly distributed over the entire site to be planted. The site shall then be raked lightly to provide scant cover and lightly watered. From that date forward, the Contractor shall be responsible for watering the seed daily for the next five days in the absence of rainfall during that period.

Following the period of intense watering, the Contractor shall be responsible for watering the seed once weekly for three consecutive weeks. The Contractor will not be required to water the seed in any week in which the accumulated rainfall for the week exceeds one inch.

The Consultant shall have the authority to increase or decrease the quantity of water used during each watering event.

Lime and Fertilizers: These materials shall consist of commercial quality ground limestone and commercial chemical fertilizer containing stated ratios of nitrogen, phosphorous and potash. The latter shall be transported and stored in containers to insure proper protection and handling. Ratio of nitrogen, phosphorous, and potash nutrients shall be 1:1:1 per Consultant's instructions and applied at a rate of one half (0.5) pounds of nitrogen per one thousand (1000) square feet. Additionally, pelletized lime shall be spread at a rate of two tons per acre. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work will shall meet the approval of the Consultant. Unless otherwise specified, two applications of fertilizer are required. The first shall be within five days of planting. The second shall be 30 days after the first application.

END OF SECTION 164

**SECTION 164-N**  
**NATIVE GRASS SEEDING- JOB SPECIFIC**

DESCRIPTION: Seeding shall consist of providing and planting East Texas Native Grass Mix (East Texas Seed Company - 903-597-6637) or equal grass seed on all areas disturbed on the project site not scheduled for sod or hydromulching, including watering and fertilizing. See plans for specific seed mix.

CONSTRUCTION METHODS: Immediately prior to seeding the Contractor shall cross disk the areas to be seeded to a minimum depth of 4". The site shall then be dragged and rolled to a smooth surface and planted with East Texas Native Grass Mix seed. Seed shall be applied by whatever means the Contractor deems appropriate at a rate of not less than 30 pounds per acre. Seeds shall be evenly distributed over the entire site to be planted. The site shall then be raked lightly to provide scant cover and lightly watered. From that date forward, the Contractor shall be responsible for watering the seed daily for the next five days in the absence of rainfall during that period.

Following the period of intense watering, the Contractor shall be responsible for watering the seed once weekly for three consecutive weeks. The Contractor will not be required to water the seed in any week in which the accumulated rainfall for the week exceeds one inch.

The Consultant shall have the authority to increase or decrease the quantity of water used during each watering event.

Lime and Fertilizers: These materials shall consist of commercial quality ground limestone and commercial chemical fertilizer containing stated ratios of nitrogen, phosphorous and potash. The latter shall be transported and stored in containers to insure proper protection and handling. Ratio of nitrogen, phosphorous, and potash nutrients shall be 1:1:1 per Consultant's instructions and applied at a rate of one half (0.5) pounds of nitrogen per one thousand (1000) square feet. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work will shall meet the approval of the Consultant. Unless otherwise specified, one application of fertilizer is required. The fertilizer shall be applied within five days of planting. Additionally, two tons of pelletized lime per acre shall be applied.

END OF SECTION 164-N

## **SECTION 167 HYDROMULCHING**

### **PART 1 GENERAL**

#### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and all applicable specification sections, apply to this section.

#### 1.02 DESCRIPTION

- A. This section specifies the requirements for preparing ground and providing seed, topsoil, water and fertilizer necessary for hydromulching.

#### 1.03 SUBMITTALS

- A. Seed Certification - Certification shall be submitted from the supplier for each type of seed specified. Certification shall accompany the delivery of the seed and shall indicate that the seed is in accordance with the requirements of the Texas Seed Law.
- B. Fertilizer Certification - Certification shall be submitted from the fertilizer manufacturer as to the chemical analysis of the fertilizer, a listing of the elements contained therein and their percentages. Certification shall also indicate that the fertilizer is in accordance with the requirements of the Texas Fertilizer Law.

#### 1.04 PRODUCT HANDLING

- A. Seed Delivery - Each variety of seed shall be delivered in separate bags or containers, labeled to indicate pure live seed, name and type of seed.
- B. Fertilizer Delivery - Fertilizer shall be delivered in the manufacturer's unopened containers, labeled to indicate the manufacturer's name and product identification. Containers shall be stored protected from ground contact and from the elements.

#### 1.05 GUARANTEE

- A. A written guarantee shall be provided guaranteeing to maintain the treated areas in a healthy, vigorous, undamaged condition for a period of 60 days beginning on the date of written acceptance of the work.
- B. Contractor shall guarantee a full stand of grass, 95% cover with no bare areas in excess of 6 inches diameter.
- C. Guarantee shall provide for timely filling, leveling and repairing eroded areas, reseeding areas exhibiting lack of healthy growth and mowing as necessary to maintain a neat appearance.

### **PART 2 PRODUCTS**

- A. Type - Turf grass seed shall be appropriate to season. The seed shall be harvested within 1 year prior to Planting, free of Johnson grass, field bind weed, dodder seed, and free of other weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. The seed shall be extra fancy grade, treated with fungicide, and shall have a germination and purity that will produce, after allowance for Federal Seed Act tolerances, a pure live seed content of not less than 85 percent, using the formula: purity percent times (germination percent times plus

hard or sound seed percent). Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations.

B. Amounts:

Item	Rate Per 1000 Sq. Ft.
Seed	As per season, see below
Fertilizer	12 lbs.
Water	As needed
Real Virgin Wood Fiber Mulch	Minimum 50 lbs. to achieve covering of seeded area

C. Spring/Summer Planting (April 15 to Sept. 15)

Hulled Bermuda 2 lbs./1,000 Sq. Ft.

D. Fall/Winter Planting (September 15 to April 15)

Unhulled Bermuda 1 1/2 lbs./1,000 Sq. Ft.

KY Fesque 5 lbs./1,000 Sq. Ft.

E. Fertilize as per paragraph B.

2.02 TOPSOIL

A. Topsoil shall be friable clay loam surface soil reasonably free of clay lumps, stones, weeds, roots and other objectionable material, a product of on site operations.

2.03 SOIL RETENTION BLANKETS

A. Soil retention blankets where shown on the plans shall be photodegradable or biodegradable excelsior blankets or woven paper mats commercially manufactured for installation on bare soils to protect construction areas from washing. Blankets shall be installed snugly over the area to be protected using six inch long "U" shaped wire staples on 2'-0" centers along edges add at staggered 4'-0" spacing on the mat face. No gaps shall be left between adjoining mats. Blankets shall be equal to AMXCO "Curlex" or Gulf States Paper Company's "Hold-Gro" woven paper mesh.

2.04 FIRE ANT INSECTICIDE

A. Spot treat fire ant insecticide in the entire area of seeding as Per Section 02930 Planting.

2.05 FERTILIZER FOR FERTILIZING

A. (Tank Mix) shall be 13-13-13 grade, pelleted, uniform in composition, free flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name or trademark and warranty of the producer.

2.06 WOOD CELLULOSE FIBER MULCH

A. Wood cellulose fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed an appropriate color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily

absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air dry weight of the fiber, a standard equivalent to 19 percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that it meets all of the foregoing requirements.

2.07 SLURRY MIX COMPONENTS PER ACRE

Wood Cellulose Fiber Mulch	2,200 pounds
Grass Seed	As Specified
Fertilizer (13-13-13)	As Specified

**PART 3 EXECUTION**

3.01 INSPECTIONS

- A. Surfaces indicated to be seeded shall be inspected to verify that all preparatory work in the area has been completed. Seeding shall not start until all preparatory work has been completed. Requests for inspections shall be made at least two days prior to anticipated date of inspection.

3.02 PREPARATION

- A. All areas to receive seed shall be stripped and/or treated with a contact herbicide prior to seeding as necessary to remove weeds, unless otherwise noted on drawings.
- A. Lime: These materials shall consist of commercial quality ground limestone and shall be added at the rate of two (2) tons per acre.
- B. Areas to receive seeding shall be loosened by manual or mechanical means to a depth of 1 1/2 inches, leveled and fine graded by hand raking. All stone (1" in diameter and larger in the top 2" of soil) are to be removed, tree stumps, brush, roots, vegetation, rubbish and other foreign matter shall be removed from the site. No foreign matter may be buried on the site. All tree stumps must be removed to a depth of two (2) feet below finish subgrade.
- D. Grade site for even and consistent slopes as per Section 02930 - Planting, Paragraph 3.01.

3.03 APPLICATION

- A. Special Mulching Equipment and Procedures: Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to forty (40) pounds of fiber plus a combined total of seventy (70) pounds of fertilizer solids for each one hundred (100) gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum capacity of eight hundred (800) gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The Owner's Representative may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.

- B. Mixing: Care shall be taken that the slurry preparation takes place on the site of the work. Spraying shall commence immediately when the tank is full.
- C. Operators of hydromulching equipment shall be thoroughly experienced in this type of application. Apply specified slurry mix in a motion to form a uniform mat at specified rate. The operator shall spray the area with a uniform, visible coat by using the green color of the wood pulp as a guide. Keep hydromulch within areas designated and keep from contact with other plant material. Slurry mixture which has not been applied within four (4) hours of mixing shall not be used and shall be removed from the site.
- D. After installation, the Contractor shall not operate any equipment over the covered area. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.
- E. After a stand of grass has been established and in the fall (September 15 through November 15), wildflower seed shall be broadcast in designated area. Area shall be worked slightly to achieve acceptable seed / soil contact.
- F. Seeded Areas: If, in the opinion of the Consultant, unplanted skips and areas are noted after hydromulching, the Contractor shall be required to seed the planted areas with the grasses that were to have been planted at no additional cost to the Owner.

3.04 MAINTENANCE OF HYDROSEEDDED AREAS

- A. After installation, hydroseeded areas shall be watered in an amount and as often as necessary to keep seed beds moistened to their full depth for a period of 2 weeks.
- B. After initial 2 weeks of watering, seeded areas shall be watered and maintained to insure a healthy, vigorous growth throughout the installation period and the landscape maintenance period.

3.05 MAINTENANCE

- A. Seeded areas shall be maintained in good condition throughout the duration of the project and the maintenance period in accordance with the maintenance described in Section 163.

END OF SECTION 167

**Section 170  
WILDFLOWER PLANTING**

1. DESCRIPTION: Provide all materials, labor, and equipment to complete the work of this section. WILDFLOWER PLANTING shall consist of all processes included in ground preparation, sowing of wildflower seed mix, and maintenance associated with seed establishment.

2. MATERIALS:

A. Wildflower Seed: Seed shall consist of *SOUTHEASTERN WILDFLOWER MIX* (Wildseed Farms 800.848.0078) as mixed with the specifications outlined below. The seed shall be free from obnoxious weeds or grasses and shall not contain any matter deleterious to its growth or which may affect its subsistence or hardiness when planted. The seed shall be applied at the rate of twenty-two (22) pounds per acre.

Common Name	% by Weight	Common Name	% by Weight
Indian Blanket	8.93	Plains Coreopsis	4.30
Purple Coneflower	6.95	Moss Verbena	4.30
Scarlet Flax	6.61	Black-Eyed Susan	3.96
Lemon Mint	6.28	Clasping Coneflower	3.74
Cosmos	5.84	Dwarf Red Coreopsis	2.31
Five Spot	5.62	Corn Poppy	2.20
Drummond Phlox	5.29	Sweet Alyssum	1.98
Tickseed	5.07	Evening Primrose	1.98
Rocket Larkspur	4.85	Showy Primrose	1.98
Dame's Rocket	4.74	Mexican Hat	1.85
African Daisy	4.74	Toadflax	1.21
Cornflower	4.41	Yarrow	0.88

B. Carrier: Clean masonry sand free of any objectionable material, debris, or seed from any other plant material. This inert material will be thoroughly mixed with the wildflower seed to aid in even distribution at a rate of 4 parts sand to 1 part seed.

C. Herbicides: Roundup® Pro by Monsanto (314.694.1000) and Ornamec 170® by PBI Gordon Corporation (800.821.7925).

3. SITE PREPARATION:

A. Site shall be sprayed with Roundup® Pro nonselective herbicide to eliminate any vegetation that may compete with wildflower germination. Apply herbicide according to manufacturer's instructions. Several applications may be required to ensure that no cool season plants will hinder the emergence of the wildflower seed.

B. Mow the dead vegetation as short as possible. Collect all clippings and thatch layers and remove from site.

C. To prepare the seedbed the soil surface shall be lightly raked or tilled to a **maximum** depth of one (1) inch. Exposed weedy vegetation and debris shall be removed from surface.

D. The prepared site shall be well draining with no areas that shall be prone to ponding.

4. SEEDING:

A. The wildflower seed mix shall be thoroughly incorporated with the masonry sand to a ratio of 4 parts inert sand to 1 part wildflower seed mix.

B. Using a calibrated spreader, apply the seed mixture at the rate of eleven (11) pounds of **SEED** per acre - (this is one half (1/2) of the seeding rate) - uniformly over the prepared seedbed. Then spread the remaining seed - eleven (11) pounds per acre - in the direction perpendicular to the direction of the initial seeding.

C. Press the seed into the soil by rolling over the planted area. Do **NOT** cover the seed any deeper than one sixteenth (1/16) of an inch. Some seeds will remain visible.

5. TIMING: Actual seeding time shall be timed to coincide with the autumn months between October and December.

6. MAINTENANCE:

A. Emergence of broadleaf weed species will require hand weeding after the site has been seeded.

B. During the establishment of the wildflower meadow it may be necessary to treat the area with Ornamec 170® herbicide to eliminate competition from grass species that were not completely eliminated during the site preparation. (This is necessary only when grass species appear in the planted area.)

C. After the full bloom period has passed late in the growing season, allow two to three (2-3) weeks then mow the wildflower meadow to a height of five to six (5-6) inches. Do **NOT** mow the area shorter than four (4) inches.

**The following wildflower mix is better suited for the central and western areas of the state.**  
**NOT USED**

Common Name	% by Weight	Common Name	% by Weight
Texas Bluebonnet	18.46	Baby's Breath	2.86
Indian Blanket	8.00	African Daisy	2.75
Scarlet Flax	6.60	Plains Coreopsis	2.24
Tickseed	6.45	Clasping Coneflower	1.98
Lemon Mint	6.23	Black-Eyed Susan	1.76
Purple Coneflower	5.86	Mexican Hat	1.56
Drummond Phlox	5.29	Moss Verbina	1.44
Cornflower	4.40	Corn Poppy	1.40
Rocket Larkspur	4.40	Toadflax	1.21
Baby Blue Eyes	4.40	Dwarf Red Coreopsis	1.10
Ox-Eyed Daisy	4.18	Showy Primrose	0.77
California Poppy	3.14	Yarrow	0.44
Yellow Cosmos	2.86	Texas Paintbrush	0.22

**SECTION 301**  
**Site Preparation and Erosion Control**

**1. Scope of Work**

The contract work to be performed under this section of the specifications includes furnishing all labor, materials, equipment, implements, transportation, supplies and supervision for performing all operations in connection with site clearing, site grading and disposal of refuse.

The Storm Water Pollution Prevention Plan for the project is the responsibility of the Contractor. The Contractor will be required to file a Notice of Intent (NOI) prior to commencement of construction and monitor site erosion throughout the construction process. Once the project is completed, the contractor shall file the required Notice of Termination with the EPA.

**2. Clearing and Grubbing**

**A. Description**

"Clearing and Grubbing" shall consist of the removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish and other objectionable matter.

**B. Construction Methods**

The Construction Site shall be cleared of brush, logs, rubbish, trees and shrubs, except such trees and shrubs and certain areas designated by the Consultant for preservation. Those trees, shrubs and other landscape features specifically designated by the Consultant for preservation shall be attentively protected from abuse, marring, or damage during construction operations. Continual parking and/or servicing of equipment under the branches of trees designated for preservation will not be permitted.

**3. Burning of Brush - NOT ALLOWED THIS PROJECT**

When burning of brush is permitted, the following shall govern:

The Contractor will be responsible for compliance with all federal, state or local laws and regulations relative to the building of fires. The City of Longview Fire Department and the Texas Forestry Service shall be notified of the intention to burn before burning any brush or other debris. Brush piles and fires shall be controlled as to size to eliminate possible dangers of forest or grass fires.

Brush to be disposed of by burning shall be burned at locations that will avoid all hazards, such as damage to existing structures, construction in progress, trees and vegetation. Disposal by burning shall be kept under constant attendance until the fires have burned out or have been extinguished.

**4. Site Grading**

**A. Finish Grading**

All areas which have been regraded or stripped of top soil shall be scarified, leveled and brought to an accurate subgrade. Stripped top soil or top soil imported for the seed and or sod bed shall be spread after subsoil fills are properly compacted, meeting the approved finish grade and shall be at least six inches deep when compacted.

1. Perform fine grading within Contract limits, including adjacent transition areas, where required, to new elevations, levels, and contours indicated. Provide subgrade surfaces parallel to finished surface grades. Provide uniform levels and slopes.

2. Grade surface to ensure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes. Provide subgrade surface free of exposed boulders or stones exceeding 2 inches in greatest dimension in lawn areas.
3. Provide adequate drainage of the working area at all times.
4. Fine grade soil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.
5. Remove stones, roots, weeds, and debris while raking topsoil. Rake surface clean of stones 1 inch or larger in any dimension and of all debris.
6. Fire Ant Control - Fire ants shall be controlled with spot application of insecticide as necessary. Apply after dew has dried and when no rain is expected for 6 hours. Spot treat entire area of planting/grassing.

**5. Seeding for Erosion Control**

"Seeding for Erosion Control" consists of ground preparation, providing for sowing of seeds, fertilizing, mulching, and other management practices along and across such areas as are designated on the plans and in accordance with these specifications.

**A. Materials**

1. The accompanying tables consist of the specified "highway mix." All seed must meet the requirements of the Texas Seed law including the labeling requirements for showing pure live seed (PLS = purity x germination), name and type of seed. Seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within nine months of the time of delivery to the project. Seed shall be furnished and delivered in separate bags or containers. A sample of seed shall be furnished for analysis and testing when directed by the Consultant. The amount of seed planted per acre shall be of the type specified below and shall equal or exceed the following percentages for purity and germination or an equivalent amount of pure live seed. All cool season plant seed shall be treated with a fungicide; additionally, all legumes shall be inoculated.

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>
Bermuda and Giant Bermudagrass (Hulled)	<i>Cynodon dactylon</i>
Green Sprangletop	<i>Leptochola dubia</i>
Bahiagrass (Pensacola)	<i>Paspalum notatum</i>
Annual Rye	<i>Lolium multiflorum</i>
Oats	<i>Avena sativa</i>
Tall Fescue	<i>Festuca arundinacea</i>
Western Wheatgrass	<i>Agropyron smithii</i>
Wheat	<i>Triticum aestivum</i>
Texas Bluebonnet	<i>Lupinus subcarneus</i>
White Clover	<i>Trifolium repens</i>
Hairy Vetch	<i>Vicia villosa</i>
Crimson Clover	<i>Trifolium incarnatum</i>
Sudangrass	<i>Sorghum vulgare var. sudanense</i>

2. Lime and Fertilizers: These materials shall consist of commercial quality ground limestone and commercial chemical fertilizer containing stated ratios of nitrogen, phosphorous and potash. The latter shall be transported and stored in containers to insure proper protection and handling. Ratio of nitrogen, phosphorous, and potash nutrients shall be 1:1:1 per Consultant's instructions and applied at a rate of one half (0.5) pounds of nitrogen per one thousand (1000) square feet. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work will shall meet the approval of the Consultant. Additionally, add lime at the rate of two (2) tons per acre.

**B. Planting Season**

All planting shall be done between the dates specified except as specifically authorized in writing.

The pure live seed planted per acre shall be of the type specified with the mixture, rate, and planting dates as follows except as specifically shown on plans.

Additionally, seeding for temporary erosion control shall be done when specified on the plans or directed by the Consultant. These measures shall consist of the sowing of cool season plant seeds and the work and materials as required within this contract.

Planting Date	Mixture for Clay or Tight Soils	Mixture for Sand or Sandy Soils
Apr. 15 to Sept. 15	Green Sprangletop, 1.2 lbs. Bermudagrass, 6.9 lbs.	Green Sprangletop, 1.2 lbs. Bermudagrass, 6.9 lbs. Bahia grass (Pensacola), 10.8 lbs.
Oct. 1 to Dec. 15	Annual Rye, 1.0 lbs. Oats, 4.0 lbs Tall Fescue, 1.0 lbs. Western Wheatgrass, 2.0 lbs. Wheat, 4.0 lbs. Texas Bluebonnet, 15.0 lbs. White Clover, 1.0 lbs. Hairy Vetch, 13.0 lbs. Crimson Clover, 1.0 lbs. Sudangrass, 2.0 lbs.	Annual Rye, 1.0 lbs. Oats, 4.0 lbs Tall Fescue, 1.0 lbs. Western Wheatgrass, 2.0 lbs. Wheat, 4.0 lbs. Texas Bluebonnet, 15.0 lbs. White Clover, 1.0 lbs. Hairy Vetch, 13.0 lbs. Crimson Clover, 1.0 lbs. Sudangrass, 2.0 lbs.

**C. Preparation of Seed Bed**

Where existing undistributed soil is satisfactory, the seed bed shall be prepared by plowing or scarifying to a depth of at least four (4) inches, then harrowing and/or dragging thoroughly to smooth the surface. Where existing top soil is not acceptable for grass growth six inch minimum thickness of approved top soil shall be furnished and installed. Prevent erosion of the finish grading or ground surface. Add and disc in fertilizer with a nutrient ratio of 1:1:1 at a rate of one half (0.5) pounds nitrogen per one thousand (1000) square feet. Top soil shall be harrowed or dragged, watered and rolled lightly, to form a smooth and uniform seed bed. The seed bed shall be cultivated sufficiently to reduce the soil to a state of good tilth. The seed-bed shall be deemed in a state of good tilth when the soil particles on the surface are small enough and lie closely enough together to prevent the seed from being covered too deep for optimum germination. Cultivation of seed-bed will not be required in loose sand where depth of sand is four (4) inches or more.

After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of the contract, seeding of the type specified shall be performed in accordance with the requirements hereinafter described. Seeding shall be consistent and uniform.

#### **D. Broadcast Seeding**

The seed or seed mixture in the quantity specified shall be uniformly distributed over the areas shown on plans or where directed. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer may be distributed at the same time provided that each component is uniformly applied at the specified rate. After planting, the planted area shall be rolled with a corrugated roller of the "Cultipacker" type. All rolling of the slope areas shall be on the contour. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied as in accordance to SECTION 0167 - HYDROMULCHING, within this contract.

#### **E. Maintenance and Acceptance**

All seeded areas shall be watered and maintained until a thick stand of grass is established. After three to four weeks of favorable weather, bare spots shall be recultivated, reseeded, raked, and rolled as in the original work. Maintenance, including mowing and fertilizing, shall continue until this work is approved by the Owner.

Grass will be acceptable after a minimum of two (2) mowings by the Contractor and grass is solid, healthy and weed-free with 95% coverage and no bare spots exceeding one (1) square foot in size.

### **6. Sodding for Erosion Control**

"Sodding for Erosion Control" shall consist of providing and planting Bermuda grass sod or other acceptable sod along or across such areas as are designated herein and in accordance with specification requirements herein outlined.

#### **A. Materials**

1. The sod shall consist of live, growing Bermuda grass or other acceptable sod secured from sources where the soil is fertile. Bermuda sod shall have a healthy, virile root system of dense, thickly matted roots throughout the soil of the sod for a thickness of at least three (3) inches. St. Augustine sod shall have a healthy, virile root system of dense, thickly matted roots throughout the soil of the sod for a minimum thickness of one (1) inch. The Contractor shall not use sod from areas where the grass is thinned out, nor where the grass roots have been dried out by exposure to the air and sun to such an extent as to damage its ability to grow when transplanted. The sod shall be free from noxious weeds or other grasses and shall not contain any matter deleterious to its growth or which might affect its subsistence or hardiness when transplanted. Unless the area has been closely pastured, it shall be closely mowed and raked to remove all weeds and long-standing stems. Sources from which sod is to be secured shall be approved by the Consultant.

Care shall be taken at all times to retain native soil on the roots of the sod during the process of excavating, hauling and planting. Sod material shall be kept moist from the time it is dug until planted. When so directed by the Owner, the sod existing at the source shall be watered to the extent required prior to excavating. Sod material shall be planted within three (3) days after it is excavated. Sod delivered to the site in an unhealthy condition shall be rejected by the owner.

2. Lime and Fertilizers: These materials shall consist of commercial quality ground limestone and commercial chemical fertilizer containing stated ratios of nitrogen, phosphorous and potash. The latter shall be transported and stored in containers to insure proper protection and handling. Ratio of nitrogen, phosphorous, and potash nutrients shall be 1:1:1 per Consultant's instructions and applied at a rate of one half (0.5) pounds of nitrogen per one thousand (1000) square feet. The fertilizer shall be dry and in good physical condition. Fertilizer that is

powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work will shall meet the approval of the Consultant. Additionally, add lime at the rate of 2 tons per acre.

#### **B. Preparation of Sod Bed**

1. Where existing undistributed soil is satisfactory, the sod bed shall be prepared by plowing or scarifying to a depth of at least four inches, then harrowing and/or dragging thoroughly to smooth the surface. Where existing top soil is not acceptable for grass growth six inch minimum thickness of approved top soil shall be furnished and installed. Prevent erosion of the finish grading or ground surface. Add and disc in fertilizer with a nutrient ratio of 1:1:1 at a rate of one half (0.5) pounds nitrogen per one thousand (1000) square feet. Top soil shall be harrowed or dragged, watered and rolled lightly, to form a smooth sod bed. Contractor shall allow for the thickness of the sod when preparing the sod bed to ensure final plan elevations are achieved. Prior to laying sod, water the sod bed to a depth of approximately 6".

After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of the contract, sodding of the type specified shall be performed in accordance with the requirements hereinafter described. Sodding shall be solid and laid in strips.

#### **C. Sodding**

1. Solid Strip Sodding. At locations on the plans, or where directed, sod strips shall be carefully placed on the prepared areas. Butt and push edges and ends against each other tightly, without stretching. Avoid gaps or overlaps. Stagger the joints in each row in a brick-like fashion, using a large sharp knife to trim corners, etc. Avoid leaving small strips at outer edges as they will not retain moisture. On slopes, place the turf pieces across the slope. To avoid causing indentations or air pockets avoid repeated walking or kneeling on the turf while it is being installed or just after watering. Sod shall be so placed that the entire designated areas shall be covered. Any voids left in the strip sodding shall be filled with additional sod and tamped. The entire sodded area shall be rolled with a heavy hand roller and tamped to form a thoroughly compact and smooth solid mass. Surfaces of block sod, which, in the opinion of the Owner, may slide due to the height or slope of the surface or nature of the soil, shall, upon direction of the Owner, be pegged with wooden pegs driven through the sod block to the firm earth, sufficiently close to hold the block sod firmly in place. No pegging is allowed on sports fields. Edges along curbs, drives, walkways, etc. shall be carefully trimmed and maintained until accepted.

2. When necessary, the sodded areas shall be smoothed after planting has been completed and shaped to conform to the cross section previously provided and existing at the time sodding operations were begun. Any excess dirt from planting operations shall be spread uniformly over the adjacent areas, or disposed of as directed by the Owner, so that the completed surface shall present a slightly appearance.

3. Sodded areas shall be thoroughly watered within 30 minutes after they are planted and shall be subsequently watered at such time and in a manner and quantity directed by the Owner until completion and final acceptance of the project by the Owner.

4. Any cracks, crevices or voids in the planted area shall be filled and smoothed using sharp, weed free sand. Repeat as necessary.

#### **D. Maintenance and Acceptance**

All sodded areas shall be watered and maintained until a thick stand of grass is established. After three (3) to four (4) weeks of favorable weather, bare spots shall be resodded and rolled as in the original work. Maintenance, including mowing and fertilizing, shall continue until this work is approved by the Owner.

Grass will be acceptable after a minimum of two (2) mowings by the Contractor and grass is solid, healthy and weed-free with 95% coverage and no bare spots exceeding one (1) square foot in size.

## **7. SPECIAL PROJECT WARRANTY**

Contractor shall furnish written warranty of turf for twelve (12) months after date of final acceptance, against defects including death and unsatisfactory growth except for conditions of Owner neglect or abuse by others.

Contractor will remove and replace turf found to be dead or in unhealthy condition during the warranty period.

## **8. SOIL RETENTION BLANKETS**

Soil retention blankets where shown on the plans shall be photodegradable or biodegradable excelsior blankets or woven paper mats commercially manufactured for installation on bare soils to protect construction areas from washing. Blankets shall be installed snugly over the area to be protected using six inch long "U" shaped wire staples on 2'-0" centers along edges and at staggered 4'-0" spacing on the mat face. No gaps shall be left between adjoining mats. Blankets shall be equal to AMXCO "Curlex" or Gulf States Paper Company's "Hold-Gro" woven paper mesh.

## **9. MEASUREMENT AND PAYMENT**

Grass seeding shall be measured for payment in square yards of seeded area completed in accordance with the plans and specifications. Seeding shall be paid for at the contract unit price per square yard, complete in place, as provided in the proposal and contract. The contract unit price shall be the total compensation for furnishing and placing all seed, for furnishing and placing all soil retention blankets, for all rolling and tamping, for all fertilizer and water; for disposal of all surplus material; and for all material, labor, equipment, tools and incidentals necessary to complete the work, all in accordance, with the plans and these specifications.

Solid strip sodding shall be measured for payment in square yards of sodded area completed in accordance with the plans and specifications. Solid strip sodding shall be paid for at the contract unit price per square yard, complete in place, as provided in the proposal and contract. The contract unit price shall be the total compensation for furnishing and placing all sod, for furnishing and placing all soil retention blankets, for all rolling and tamping, for all fertilizer and water, for disposal of all surplus material, and for all material, labor, equipment, tools and incidentals necessary to complete the work, all in accordance, with the plans and these specifications.

## **10. INTENT**

The intent of this Section is for the Contractor to leave all excavated areas along the area or route of construction with a surface growth capable of resisting erosion. A secondary intent is to provide a pleasing appearance once construction is completed. Therefore, the Contractor shall include these items in his bid price at the time of submitting his bid. However, salvage and replacement of existing top soil and sod shall be considered an acceptable alternate to "seeding" or "sodding" provided, if in the opinion of the Consultant, adequate top soil and sod exists to properly cover the barren surfaces. The price for salvage and replacement shall be included under gassing line items.

## ITEM 432 RIPRAP

**432.1. Description.** This item shall govern the furnishing and placing of riprap of stone or concrete of the type indicated on the plans.

**432.2 Materials.** Stone for riprap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practicable. The stone shall be dense, resistant to the action of air and water, and suitable in all respects for the purpose intended.

The stone used for Common Mortar Riprap may consist of broken up concrete removed under the contract or obtained from other approved sources. Broken concrete shall be as nearly uniform in section as practicable and sizes specified in Article 432.8.

Materials for concrete, grout, and mortar shall conform to the requirements of the Item "Concrete for Structures". Concrete shall be of the class shown on the plans. Mortar and grout required for the several types of riprap shall consist of one part of Portland cement and three parts of sand, thoroughly mixed with water. Mortar shall have a consistency such that it can be easily handled and spread by trowel. Grout shall have a consistency such that it will flow into and completely fill all joints.

Bar reinforcement shall conform to the requirements of the Item, "Reinforcing Steel".

Wire reinforcement shall consist of welded fabric meeting the requirements of ASTM Designation: A 185.

Premolded expansion joint material shall conform to the requirements of the Item, "Concrete Structures".

**432.3 Construction Methods.** The slopes and other areas to be protected shall be dressed to the line and grade shown on the plans prior to the placing of riprap. For Dry Riprap, Type A and Type B; Grouted Riprap, Type A and Type B; and Mortar Riprap, the stones shall be so placed that the greater portion of their weight is carried by the earth and not by the adjacent stones.

Mortar or Grouted Riprap shall not be placed on embankment slopes until the embankment has been compacted thoroughly.

Spalls and small stones used to fill open joints and voids in stone riprap shall be driven to a tight fit.

**432.4. DRY RIPRAP, TYPE A and TYPE B.** Unless otherwise specified, all stones used in these types of riprap shall weigh between 50 and 150 pounds each, and at least 60 percent of the stones shall weigh more than 100 pounds each. The stones shall be placed in a single layer with close joints. The upright axes of the stones shall make an angle of approximately 90 degrees with the embankment slope. The courses shall be placed from the bottom of the embankment upward, the larger stones being placed in the lower courses. Open joints shall be filled with spalls. Stones of greater dimension than the required riprap thickness shall be embedded in the embankment to present a uniform finished top surface such that the variation between tops of adjacent stones shall not exceed 3 inches. Stones that project more than the allowable amount in the finished work shall be replaced, embedded deeper, or chipped.

Dry Riprap, Type B, differs from Dry Riprap, Type A, only in that a toe wall of concrete, having dimensions and reinforcement as shown on the plans, shall be used.

**432.5. DRY RIPRAP, TYPE C and TYPE D.** Stones having one broad flat surface shall be used when possible; this surface being placed on a horizontal earth bed prepared for it and so placed as to overlap the underlying course, the intent being to secure a lapped or "shingled" surface. Fifty percent of the mass shall be of stones weighing between 100 and 150 pounds each. These stones shall be placed first and roughly arranged in close contact. The spaces between the large stones then shall be filled with stone of suitable size so placed as to leave the surface evenly stepped, conforming to the contour required, and capable of shedding water to the maximum degree practicable.

Dry Riprap, Type D, differs from Dry Riprap, Type C, only in that a toe wall of concrete, having dimensions and reinforcement as shown on the plans, shall be used.

**432.6. GROUTED RIPRAP, TYPE A and TYPE B.** Stones used in these types of Riprap shall weigh between 40 and 150 pounds each. The stones shall be placed in the same manner as specified above for Dry Riprap, Type A and Type B with care being taken to prevent earth or sand from filling the spaces between the stones. After the stones are in place, the stones shall be wetted thoroughly and the spaces between the stones shall be completely filled with grout. The surface of the Riprap shall be swept with a stiff broom after grouting. No Riprap shall be grouted in freezing weather. The work shall be protected from the sun and kept moist for at least 3 days after grouting.

Grouted Riprap, Type B, shall have a concrete toe wall as specified for Dry Riprap, Type B.

**432.7. MORTAR RIPRAP.** Stone for this purpose, as far as practicable, shall be selected as to size and shape in order to secure fairly large, flat-surfaced stone which may be laid with a true and even surface and a minimum of voids. Fifty percent of the mass shall be broad flat stones, weighing between 100 and 150 pounds each, placed with the flat surface uppermost and parallel to the slope. The largest stones shall be placed near the base of the slope. The spaces between the larger stones shall be filled with stone of suitable size, leaving the surface smooth, reasonably tight, and conforming to the contour required. In general, the stones shall be placed with a degree of care that will insure for plane surfaces a maximum variation from the true plan of not more than 3 inches in 4 feet. Warped and curved surfaces shall have the same general degree of accuracy as specified for plane surfaces.

Before placing mortar, the stones shall be wetted thoroughly, and as each of the larger stones is placed, it shall be surrounded by fresh mortar and adjacent stones shall be shoved into contact. After the larger stones are in place, all of the spaces or openings between them shall be filled with mortar and the smaller stones then placed by shoving them into position, forcing excess mortar to the surface and insuring that each stone is carefully and firmly embedded laterally. After the work has been completed as described above, all excess mortar forced up shall be spread uniformly to completely fill all surface voids. All surface joints then shall be pointed up roughly either with flush joints or with shallow, smooth raked joints.

**432.8. COMMON DRY RIPRAP AND COMMON MORTAR RIPRAP.** The stones for this type shall be not less than one-third of a cubic foot in volume and not less than 3 inches in least dimension. The width of the stone shall not be less than twice the thickness.

Prior to placing the stones, a suitable bed shall be excavated for the base course or layer. The material secured by excavation shall be used in dikes or dams around the end of the walls or uniformly spread on embankment slopes. The base course or layer of stone shall be bedded well into the ground with their edges in contact. Each succeeding course or layer shall be well bedded into and placed on even contact with its preceding course or layer. The finished surface shall present an even, tight surface true to line and grades of typical sections.

Sufficient mortar shall be used in Common Mortar Riprap to fill completely all voids in the layers of stone, and surface shall be swept with a stiff broom. Grout may be used in lieu of mortar. Spalls and small stones used to fill open joints and voids in Common Dry Riprap shall be driven to a tight fit.

**432.9. CONCRETE RIPRAP.** Concrete for riprap shall be placed in accordance with the details and to the dimensions shown on the plans or as established by the Consultant. Unless otherwise shown by a note on the plans, concrete riprap shall be reinforced using wire or bar reinforcement.

The class of concrete shall be specified on the plans and shall be in accordance with the Item, "Concrete for Structures".

If wire reinforcement is used, it shall be a 6 by 6 inch No. 6 plain electric welded reinforcing fabric or its equal. A minimum lap of 6 inches shall be used at all splices. At the edge of the Riprap, the wire fabric shall not be less than 1 inch nor more than 3 inches from the edge of the concrete and shall have no wires projecting beyond the last member parallel to the edge of the concrete.

If bar reinforcement is used, the sectional area of steel in each direction shall not be less than the sectional area of the wire fabric described above. The spacing of bar reinforcement shall not exceed 18 inches in each direction and the distance from the edge of concrete to the first parallel bar shall not exceed 6 inches.

Reinforcement shall be supported properly throughout the placement to maintain its position approximately equidistant from the top and bottom surface of the slab.

If the slopes and bottom of the trench for toe walls are dry and not consolidated properly, the Consultant may require the entire area to be sprinkled, or sprinkled and consolidated before the concrete is placed. All surfaces shall be moist when concrete is placed.

After the concrete has been placed, compacted and shaped to conform to the dimensions shown on the plans, and after it has set sufficiently to avoid slumping, the surface shall be finished with a wooden float to secure a reasonably smooth surface.

Immediately following the finishing operation the riprap shall be cured in accordance with the Item, "Concrete Structures".

**432.10. PNEUMATICALLY PLACED CONCRETE RIPRAP, TYPE II and TYPE III.** Pneumatically placed concrete for riprap shall be placed in accordance with the details and to the dimensions shown on the plans or as established by the Consultant. Pneumatically placed concrete shall conform to the requirements of the Item, "Pneumatically Placed Concrete". Reinforcement shall conform to the details on the plans and with the Item "Reinforcing Steel". Reinforcement shall be supported properly through placement of concrete. All subgrade surfaces shall be moist when concrete is placed.

The surface shall be given a wood float finish or a gun finish as directed by the Consultant.

The strength and design of Pneumatically Placed Concrete Riprap shall be specified on the plans as either Type II or Type III in accordance with the Item, "Pneumatically Placed Concrete".

Immediately following the finishing operation, the riprap shall be cured with membrane curing compound in accordance with the Item, "Concrete Structures".

**432.11. CEMENT STABILIZED RIPRAP, TYPE M and TYPE N.** These classes of riprap shall conform to the requirements of the plans and to the regular concrete riprap specified in Article 432.9 above, with the following exceptions:

The aggregate for this riprap shall be the processed material used on the roadway as flexible base. The processed material and design of the concrete shall be specified by the Consultant.

Any royalty cost for the material to be used as aggregate shall be included in the unit price bid for riprap.

Type M riprap shall be 4 sack concrete.

Type N riprap shall be 3 sack concrete.

Immediately following the finishing operation, the riprap shall be cured in accordance with the Item, "Concrete Structures".

**432.12. MEASUREMENT.** Measurement of acceptable riprap complete in place will be made on the basis of the area actually covered, and the volume will be computed on the basis of the measured area and the thickness specified on the plans.

Concrete in toe walls will be measured as riprap of the type with which it is placed.

**432.13. PAYMENT.** The riprap quantities, measured as provided above, will be paid for at the unit prices bid per cubic yard for riprap of the various classifications shown, which price will be full compensation for furnishing, hauling, and placing all materials including reinforcement and premolded expansion joint material, and for all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for excavation of toe wall trenches and for all necessary excavation below natural ground or bottom of excavated channel will be included in the unit price bid per cubic yard of riprap.

Payment for all necessary excavation for riprap below natural ground or bottom of excavated channel, and for shaping of slopes for riprap will be included in the unit price bid per cubic yard for riprap, except that when the header banks upon which riprap is to be placed were built by prior contract, the excavation required for shaping of slopes will be paid for in accordance with the Item, "Structural Excavation".

**END OF ITEM 432**

**SECTION 1000**  
**FIBAR PLAYGROUND CUSHION**

PART I: DESCRIPTION

1. Bidder shall provide all materials for complete installation of the Fibar System as shown on the plans and as patented and licensed for production by Robert Godfrey, Ltd. or equal.
2. The materials shall be limited to the exact extent described in the specifications and drawings.
3. Fibar Systems, FibarMat, and FibarGard are available from Modlin Recreation, 1-800-235-2440 (local Exclusive Representative) or Robert Godfrey, Ltd., 141 Halstead Avenue, Mamaroneck, NY 10543-2650. Call 800-Fibar-21 or 914-835-1511. Fax 914-835-6975.

PART II: MATERIALS

A. WOOD FIBRE SURFACING

1. Surfacing shall be a mix of random-sized hardwood fibre. Standard wood chips or bark mulch **will not be acceptable**.
2. To allow for compaction, the following formula must be used to determine the correct number of cubic yards: 8" deep: Sq. ft. of playground x 0.0375.
3. Bidder will guarantee sieve analysis of wood fibre as follows: Greater than 85% passing 3/8" sieve. Less than 50% passing #60 sieve.
4. Wood fibre shall have no twigs, bark, leaf debris or other organic material incorporated within.
5. Product used shall be Fibar wood fibre, such as produced by Robert Godfrey, Ltd. or equal.

PART III: SPECIAL REQUIREMENTS

1. Alternate must have prior approval not less than three (3) days prior to bid opening.

PART IV: INSTALLATION

A. PREPARATION

1. Installer shall thoroughly examine the site and specifications, carefully checking the dimensions before starting work.

B. SUBGRADE

1. The subgrade shall be graded a minimum of 1%. It is not recommended that a Fibar System be installed on a grade greater than 10%. All roots, stones, and vegetation shall be removed.
2. The French Drain must be connected to the existing drainage system. (Not used -- no French Drain in this project.)
3. The first 6" of subgrade shall be compacted to at least 95% of the dry density, as determined by the provisions of AASHTO or T 205, as modified in 203.24.

C. APPLICATION

Fibar wood fibre

1. The Fibar wood fibre surface shall be spread to a uniform depth. All material supplied by the manufacturer **must** be installed to allow for settling and natural compaction.

END OF SECTION 1000

**SECTION 01340**  
**SUBMITTALS AND SUBSTITUTIONS**

1. DESCRIPTION:

- A. Work Included: Make submittals required by the contract documents, and revise and resubmit as necessary to establish compliance with the specified requirements. The provisions of this section apply to required submittals, related to units of work, not to administrative submittals including payment requests, insurance certificates and progress reports. In addition to specific provisions of General and Supplementary Conditions related to submittals, specification sections of Divisions 2 through 16 contain submittal requirements. Specific requirements in other sections have precedence over general requirements of this section.
- B. Work Not Included:
- a. Unrequired submittals will not be reviewed by the Consultant.
  - b. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Consultant.

2. QUALITY ASSURANCE:

A. Coordination of Submittals:

- a. General: The General Contractor shall coordinate all submittals with progress schedule and actual progress of the work. Prior to transmittal to Consultant, carefully review and coordinate all aspects of each item being submitted. Submittals shall be reviewed by the Contractor and be verified by his signature and the date. Allow 2 weeks for Consultants's initial processing of submittals requiring review and return. Use special transmittal form to establish complete record of submittals. Provide copies required by governing authorities, which are in addition to copies specified for submittal to the Consultant.
- b. Verify that each item and the submittal for it conform in all respects with the specified requirements.
- c. By affixing the Contractor's signature to each submittal, the Contractor certifies that this coordination has been performed.

B. Substitutions:

- a. The contract is based on the standards of quality established in the contract documents. Substitutions will be considered only when substantiated by the Contractor's submittal of required data within thirty-five (35) calendar days after award of the contract.
- b. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this work by the Consultant.
- c. A Contractor desiring substitution shall furnish to the Consultant specifications, cut sheets, performance data, and shop drawings along with an itemized statement of any and all differences between the proposed substitute and the specified item which in any way affect the item's life expectancy, maintenance, operating conditions, and suitability for the job.

- d. The Contractor shall further state all modifications to the project work made necessary by such substitution. The Contractor shall bear all costs associated with said modifications.
3. SUBMITTALS: Make submittals of shop drawings, samples, substitution requests, and other items in accordance with the provisions of this Section.
4. SHOP DRAWINGS:
  - A. Scale and Measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
  - B. Types of Prints Required:
    - a. Submit shop drawings in the form of three blueline or blackline prints of each sheet. Maintain one print as mark-up copy for record drawings. Consultant will retain one copy and the remainder will be returned.
    - b. Blueprints will not be acceptable.
  - C. Review comments of the Consultant will be shown on one set of prints when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purposes.
5. MANUFACTURER'S LITERATURE:
  - A. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents is being submitted for review.
  - B. Copies of Product Data: Submit the number of copies which are required to be returned, plus two copies which will be retained by the Consultant. Mark each copy to indicate actual product to be provided; show selections from among options in manufacturer's printed product data. Except as otherwise indicated, submittal is for information and record (Not for Consultant's approval). Maintain an additional copy at project site for reference purposes. Do not proceed with installation of manufactured products until a copy of related product data is in Installer's possession at project site.
6. SAMPLES:
  - A. Provide sample or samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.
  - B. Number of Samples Required: Unless otherwise specified, submit three sets of samples, one set will be retained by the Consultant.
7. COLORS AND PATTERNS: Submit accurate color and pattern charts to the Consultant for selection. Except as otherwise indicated, sample submittals are for the Consultant's observation of color, texture, pattern and "kind", as applicable. Maintain a returned set at the project site for purposes of quality control comparisons.
8. SUBCONTRACTORS AND MATERIAL SUPPLIERS: Submit a list of the subcontractors and material suppliers with the names of the manufacturers of major items of material and equipment each proposes to furnish.
9. SCHEDULE OF VALUES: Submit a schedule of values to be approved by the Consultant and used

to evaluate the Contractor's pay requests.

10. IDENTIFICATION OF SUBMITTALS:

A. Consecutively Number All Submittals:

- a. When material is requested for any reason, transmit under a new letter of transmittal and with a new transmittal number.
- b. On re-submittals, cite the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

D. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Consultant for his review upon request.

11. TIMING OF SUBMITTALS:

A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

B. In scheduling, allow at least ten (10) working days for review by the Consultant following his receipt of the submittal.

C. Color Selections: Submit all color samples as soon as possible so that the Consultant may coordinate colors. The Consultant may choose to delay approval of submittals if all color samples are not in his hands and this delay will be the responsibility of the Contractor.

12. CONSULTANT'S REVIEW:

A. Review by the Consultant does not relieve the Contractor from responsibility for errors which may exist in the submittal data. The Consultant shall review such data for the conformance to the product specified and not verify dimensions in accordance with approved drawings. Checking of drawings is to be regarded as gratuitously assisting the Contractor and the Consultant or the Owner does not thereby assume responsibility for such errors or omissions as are discovered later. They must accordingly be made good by the Contractor irrespective of any approval by the Consultant at no additional cost to the Owner.

B. Revisions:

- a. Make revisions required by the Consultant.
- b. If the Contractor considers any required revisions to be a change, he shall so notify the Consultant.
- c. Make only those revisions directed or approved by the Consultant.

C. Consultant's Decision Final: The Consultant alone shall decide whether a proposed substitute

is an acceptable equal to the product specified.

13. Copies of Miscellaneous Submittals: Except as otherwise indicated, provide copies as follows:
  - a. Special Project Warranties: Two (2) executed copies, plus conformed copies as required in maintenance manuals.
  - b. Specified Product Warranties: Two (2) executed copies, plus conformed copies as required in maintenance manuals.
  - c. Coincidental Product Warranties: Single copy, plus copies as required in maintenance manuals.
  - d. Inspection/Test Reports and Certificates: Where not processed as shop drawings or product data, provide two (2) copies plus copies required for maintenance manuals.
  - e. Field Records: Four (4) copies, including one (1) copy which will be returned for inclusion in submittal of record documentation.
  - f. Maintenance Manual: Two (2) bound copies and PDF of O and M manuals.
  - g. Record Drawings: Original maintained mark-up prints.
  - h. Miscellaneous Record Documentation: Original maintained mark-up copy.
  
14. Architect's/Engineer's Action:
  - A. General: Refer to General Conditions for indication and definition of action by Consultant upon receipt and processing of submittals from Contractor. Submittals will be returned without action where received indirectly (not through Contractor).

**SECTION 01530  
TREE PROTECTION**

1.01 GENERAL

- A. Contractor shall be responsible for protecting all trees, shrubs and lawn areas that are to remain in place during construction operations. It will not be necessary to provide tree protection fencing throughout the work area but it will be necessary to limit the amount of construction equipment among trees and all as approved by Owner and Landscape Architect.
- B. Related Documents
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions that apply to this section.
- C. Summary
  - 1. This Section includes the protection and trimming of all trees on the site.
  - 2. Related Sections include the following:
    - a. Site Preparation, Earthwork
- D. Submittals
  - 1. Product data; for each type of product indicated.
  - 2. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, name and addresses of architect and owners, and other information specified.
- E. Quality Assurance
  - 1. Tree service qualifications: an experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this project and that will assign an experienced, qualified arborist to this project site on a full-time basis during execution of the arboricultural work.
  - 2. Arborist qualifications: and arborist certified by the International Society of Arboriculture and licensed in the state of Texas.
  - 3. Tree pruning standards: comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance - Standard Practices".
  - 4. Pre-installation conference: Conduct conference at project site to comply with requirements.
    - a. Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Landscape Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least three working days before convening conference. Record discussions and agreements and furnish a copy to each participant.

1.02 PRODUCTS

- A. Materials:
  - 1. Tree protection fencing:
    - a. All areas marked or described on the plans for tree protection shall be fenced with high density polyethylene safety fence shall be installed and maintained throughout the construction period.
    - b. Fencing shall be a minimum of four feet height and secured by steel 'T' stakes at no more than eight (8) feet on center.

1.03 EXECUTION

- A. Preparation
  - 1. Temporary fencing: install temporary fencing located as indicated or described on the plans at outside the drip line of trees to be protected. Includes all trees (roots, trunk and branches) generally outside of the project limits but within and area adjacent to the project limits that may be damaged by construction operations.
  - 2. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

3. Do not store construction materials, debris, or excavated materials within the drip line of remaining trees. Do not permit vehicles or foot traffic within drip line; prevent soil compaction over root systems.
4. Do not allow fires under or adjacent to remaining trees or other plants.

#### 1.04 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within drip line of trees, unless otherwise indicated or as approved by Owner.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
  1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.
  2. Do not allow exposed roots to dry out before placing in permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- D. Where utility trenches are required within drip line of trees, tunnel under or around roots by digging, auger boring, pipe jacking, or digging by hand.
  1. Root pruning: do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments, do not break or chop.
  2. Do not leave roots exposed for more than 24 hours. Provide temporary cover as approved by Owner if work within root zone will not be completed within 24 hours of exposure of roots either by grading or trenching.

#### 1.05 REGRADING

- A. Grade lowering: where new finish grade is indicated below existing grade around trees, slope grade beyond drip line of trees and as recommended by qualified arborist. Maintain existing grades within drip line of trees except where approved otherwise by Owner.
- B. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots. Cut only smaller roots with sharp pruning instruments. Do not break, tear or chop.
- C. Minor fill: where existing grade is six (6) inches or less below elevation for finish grades, fill with topsoil. Place topsoil in a single un-compacted layer and hand grade to required finish elevations.

#### 1.06 TREE PRUNING

- A. Prune remaining trees affected by temporary and new construction and as indicated or described on the plans.
- B. Prune remaining trees to compensate for root loss caused by damaging or cutting root systems. Provide subsequent maintenance during Contract period as recommended by qualified arborist.
- C. Pruning Standard: prune trees according to ANSI A300 as follows:
  1. Type of pruning: crown cleaning
  2. Type of pruning: crown thinning
  3. Type of pruning: crown raising
  4. Type of pruning: crown reduction
  5. Type of pruning: vista pruning
  6. Type of pruning: crown restoration
- D. Cut branches with sharp pruning instruments: do not break, tear or chop.
- E. Chip branches removed from trees and spread chips where indicated or as directed by Owner or Architect.

1.07 TREE REPAIR

- A. Promptly repair trees damaged by construction operations within 24 hours of damage. Treat damaged trunks, limbs, and roots according to written instructions of the qualified arborist.
- B. Remove dead and damaged trees that the qualified arborist determines to be incapable of restoring to a normal growth pattern.
- C. Aerate surface soils which have been compacted during construction. Aerate an area within 10 feet beyond drip line and no closer than 3 feet to tree trunk. Drill 2 inch diameter holes a minimum of 12 inches deep at 2 feet on center and backfill holes with an equal mix of prepared soil and native soils or employ other aeration methods as approved by Owner's representative.

1.08 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: remove excess excavated materials, displaced trees, and excess chips from Owner's property.
- C. Chipping: removed trimmings and trees may be chipped into mulch and reused on site upon approval of Owner or Architect.

1.09 DAMAGES ASSESSMENT

- A. When trees, shrubs or lawn areas are disfigured, killed, or badly damaged as a result of construction operations, the Contract Sum will be reduced by the amount determined from the following:
  - 1. Trees: International Shade Tree Conference formula:  $D \times 0.7854 \times \$36.00$ , where D is the diameter in inches of the trunk of the tree measured 12" above grade. Damage to any branches larger than two (2) inches in diameter will result in a fine of \$150.00 per caliper inch.
  - 2. Shrubs: damage shall be assessed at replacement cost for typical type and size of material.
  - 3. Lawn; damage shall be assessed at cost to re-grade and re-vegetate with approved material.
- B. Parking of vehicles, construction equipment or material storage under trees will not be permitted. Contractor will be fined \$100.00 for each violation.

## **Section 1640 Product Handling**

### **DESCRIPTION**

- A. Work Included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section. Protect all owner direct-purchase equipment delivered for use on this project.
  
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Considerations, Supplementary Conditions, and Sections of these Specifications.
  - 2. Additional procedures also may be prescribed in other Sections of these specifications.

### **QUALITY ASSURANCE:**

Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

### **MANUFACTURER'S RECOMMENDATIONS:**

Except as otherwise approved by the Consultant, determine and comply with manufacturer's recommendations on product handling, storage, and protection.

### **PACKAGING:**

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
  - 1. Maintain packaged materials with seals unbroken and labels intact until time of use. Keep off the ground with pallets.
  - 2. Promptly remove damage material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
  - 3. Weatherproof all cardboard shipping containers for storage with plastic wrap, tarpaulins or shelters. Warehouse products not designed for outdoor exposure.
- B. The Consultant may reject as non-complying such material and products that do not bear identification satisfactory to the Consultant as to manufacturer, grade, quality, and other pertinent information.

### **UNLOADING:**

Furnish all equipment to unload shipments (including direct owner purchase equipment). Provide access for delivery trucks. Designate and protect all storage sites.

### **PROTECTION:**

- A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled. Protect fresh concrete.
- B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.
- D. Protect paints and other liquids from freezing.
  
- E. Secure all materials from theft. Provide lockable storage buildings or trailers.
- F. Inspect and inventory all shipments immediately noting any shipping damage or missing equipment. Notify the Consultant immediately.

**REPAIRS AND REPLACEMENTS:**

In event of damage, promptly make replacements and repairs to the approval of the Consultant and at not additional cost to the Owner.

END OF SECTION 1640

**SECTION 1705  
PROJECT CLOSEOUT**

**PART I GENERAL**

**1.01 RELATED DOCUMENTS:**

- A. The Uniform General Conditions and Supplementary General Conditions and applicable requirements of all Divisions of the Contract Specifications govern this section. In the event of conflict between specific requirements of the various documents; the more restrictive, the more extensive (i.e. more expensive) requirement shall govern.

**1.02 GENERAL DESCRIPTION OF REQUIREMENTS:**

- A. DEFINITION: Project Closeout is hereby defined to include requirements near the end of the Contract Time, in preparation for substantial completion acceptance, occupancy by Owner, reduction in or release of retainage, final acceptance, final payment, normal termination of contract, and similar actions evidencing completion of the work. Specific additional requirements for individual units of work are specified in the individual specifications for each item.
- B. TIME of closeout is directly related to substantial completion and acceptance, and therefore may be either a single time period for the entire project, or a series of time periods for individual portions or phases of the project which have been certified as substantially complete at different dates.
1. This section is based on completion and acceptance of the entire project during a single time period.
  2. If the project is to be accepted in phases, whether by originally specified project scope or by subsequent agreement between the parties, then Project Closeout requirements shall pertain to each separately accepted portion or phase of the project; unless by written directive the Owner allows for these requirements to be done singularly upon anticipated acceptance of the final phase.
- C. REQUIRED DOCUMENTS for Project Closeout include, but are not necessarily limited to the following, which are required at various stages of project completion:
1. As-Built Record Drawings and Specifications
  2. Operating & Maintenance Manuals
  3. Record Approved Submittals and Samples
  4. Completed Punch Lists
  5. Final Release of Claims
  6. Consent(s) of Surety
  7. Evidence of turn over of spare parts
  8. Evidence of User Training

**1.03 REQUIREMENTS AT VARIOUS STAGES OF COMPLETION:**

**A. SUBSTANTIAL COMPLETION:**

1. Prior to requesting Consultant and Owner to schedule a substantial completion, or pre-final, inspection (for either the entire work or portions thereof as agreed to by the parties to the contract); complete the following and list known exceptions in request.
  - a. In progress payment request coincident with period of time anticipated for substantial completion, Contractor's payment request should reflect a minimum of 95% completion for all applicable work.
  - b. Submit to Consultant and Owner a complete copy of the Contractor's most current punch list covering the portions(s) of the project claimed as substantially complete.
    1. Such punch list shall indicate dates of Contractor re-checks and completion of

- work items noted.
2. All items remaining outstanding on the Contractor's punch list shall include a projected date of completion and/or correction with an explanation of why such is not presently completed.
  - c. Submit to the Consultant for review the full set of as-built blueline markups as described later in this section.
  - d. Submit to Consultant for review the preliminary copies of Owner's Operating and Maintenance (O&M) Manuals as described later in this section.
  - e. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where applicable) operating certificates, and similar releases.
  - f. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.
- B. If Owner intends to occupy project upon substantial completion acceptance, contractor shall make final change-over of locks and transmit keys to owner, and advise owner's personnel to change-over in security provisions. Upon written directive from Owner, this task may be waived until final acceptance for the convenience of the contractor in completing punch list activity.
- C. Complete instructions of Owner's operating and maintenance personnel. Arrange for each installer of work requiring continuing maintenance (by Owner) or operation to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work.
1. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, identification system, control sequences, hazards, cleaning and similar procedures and facilities.
  2. For each whole system for which equipment data, operating manuals, and systems drawings are required; the Contractor shall provide engineers or technicians to instruct and train the Owner's personnel in the use, operation, and maintenance of the equipment.
  3. The training period shall be of sufficient duration to fully familiarize the Owner's personnel, with all instructions and procedures covered by the submitted equipment data, including such systems theory as is necessary to provide the Owner with trained and competent personnel to use, operate and functionally maintain the systems. All training shall be to the satisfaction of the Owner.
- D. Complete initial clean up requirements as described later in the section for the entire portion of the project claimed as substantially complete.
- E. Touch up and otherwise repair and restore marred exposes finishes.
- F. Substantial Completion Inspection Procedure:
1. Upon receipt of evidence of compliance with above noted requirements along with contractor's notice that work has been substantially completed, as evidenced by receipt of Contractor's punch list with completion and/or corrections noted; Owner and Consultant will schedule substantial completion inspection of the work. If status of work is found to be as indicated on Contractor's punch list, the Consultant will prepare substantial completion punch list noting all items requiring completion and/or correction.
  2. If investigation indicates that Contractor's punch list did not accurately reflect status of the work, or if corrections and/or completion has not been substantially resolved by the Contractor; the Inspection will be terminated and all Owner and A/E costs for scheduling and attendance at the resulting re-inspection(s) will be the responsibility of the Contractor.

B. RELEASE OF RETAINAGE: (See Special Provisions)

C. FINAL ACCEPTANCE:

1. Prior to requesting Consultant and Owner to schedule Final Inspection for the Project, complete the following.
  - a. Prepare draft payment request showing 100% completion for each line item of the Schedule of Values. Submit with this draft all final releases and supporting documentation not previously submitted and accepted. Include Certificates of Insurance where applicable. Note that Final Payment (including final release of retainage) will not be issued until all work (including punch list items) has been completed, all requirements met, and Final Change Order has been processed.
  - b. Submit copy of Consultant's pre-final (or substantial completion) punch list, including evidence that each item has been completed or otherwise resolved.
  - c. Submit final meter readings for utilities, and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.
  - d. Submit final record as-built drawings and specifications, two copies of all approved submittals, and operating & maintenance manuals as described later in this section. This includes specific warranties, maintenance agreements, product certifications and similar documents. Record closeout documentation must be acceptable to Consultant and Owner prior to issuance of final payment.
  - e. Complete final cleaning requirements, including touch-up of marred surfaces.
  - f. Submit consent of surety to Final Payment.
  - g. Revise and submit evidence of final and continuing insurance coverage complying with applicable insurance requirements.
2. Final Acceptance Inspection Procedure:
  1. Upon compliance with all above noted requirements, and following completion of the work required in the substantial completion punch list, provide written notice to the Consultant and Owner that the project is ready for Final Inspection.
  2. Upon receipt of evidence of compliance with above noted requirements for Final Acceptance; the Consultant and Owner will schedule a Final Acceptance Inspection.
    - a. If status of work is found to be as indicated by Contractor as being complete and in compliance with the conditions of the contract, the Consultant will provide written recommendation to the Owner to accept the project.
    - b. If, however, this investigation indicates that corrections and/or completion has not been resolved by the Contractor; the inspection will be terminated and all Owner and A/E costs for scheduling and attendance at the resulting re-inspection will be the responsibility of the Contractor. In case of remaining correction/completion items, the Contractor shall again notify the Consultant and Owner when all such have been resolved, and request re-inspection.

PART 2 NOT USED

PART 3 EXECUTION

3.01 PROJECT CLEANING AT SUBSTANTIAL COMPLETION:

A. General:

1. The Contractor is required to maintain the project and site in a clean and orderly condition throughout the course of construction. In addition to continuous project cleaning, the following requirements are related to project close-out.
2. Special cleaning for specific units of work may also be specified in other sections of project specifications.
3. Provide final cleaning of the work consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program.

B. Comply with manufacturer's instructions for cleaning of all system components, equipment, and materials incorporated into the project.

C. The following "initial" final cleaning is to be accomplished immediately prior to the time the Contractor requests Substantial Completion Inspection:

1. Remove labels which are not required as permanent labels.
2. Clean exposed hard-surfaced finishes, including glass, metals, stone, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Restore reflective surfaces to original condition.
3. Remove debris and surface dust from limited-access spaces including plenums, shafts, and similar spaces.
4. Clean concrete floors in non-occupied spaces; wet-mot and broom clean.
5. Clean light fixtures and lamps removing all dust and debris, so fixtures and lamps will function with full efficiency.
6. Remove crates, cartons and other flammable waste materials or trash from work areas. Building(s) shall be turned over to the Owner free of concealed garbage, trash and rodent infestation. If any of the preceding are revealed, or odors from them occur, they shall be removed by the Contractor at his expense. Restore property to its original condition where no improvements are shown.
7. Elevator shafts, electrical closets, pipe and duct shafts, chases, furred spaces, and similar spaces which are generally unfurnished, shall be cleaned and left free from rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt and dust.
8. Lawn areas shall be mowed and edged and otherwise groomed.
9. Care shall be taken by workmen not to mark, soil or otherwise deface finished surfaces. In the even that finished surfaces become defaced, all costs for cleaning and restoring such surfaces to their originally intended condition shall be the responsibility of the Contractor.

### 3.02 PROJECT CLEANING AT FINAL ACCEPTANCE:

- A. The following “final” cleaning is to be accomplished immediately prior to the time the Contractor request Final Acceptance Inspection:
1. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials.
  2. Turn the work over in immaculate condition inside and outside including the premises. Mow and trim all lawn and landscaped areas.
  3. Clean all work on the premises including walks, drives, curbs, paving, fences, grounds and walls. Slick surfaces shall be left with a clear shine. Cleanup shall include removal of smudges, marks, stains, fingerprints, soil, dirt, paint, dust, lint, labels, discolorations and other foreign materials.
  4. Clean all finished surfaces on interior and exterior of project (again) including floors, walls, ceilings, windows, glass, doors, fixtures, hardware and equipment. Final was and polish all natural finish metal on interior or exterior surfaces.
  5. In addition to the cleaning specified above and the more specific cleaning required in various sections of the specifications, the building(s) shall be prepared for occupancy by a thorough cleaning throughout, including washing (or cleaning by approved methods) surfaces on which dirt or dust has collected, and by washing glass on both sides. Wash exterior glass using a window cleaning contractor specializing in such work.
  6. Remove temporary buildings and structures, fences, scaffolding, surplus materials and rubbish of every kind from the site of the work.

### 3.03 CONTINUING INSPECTIONS:

- A. Cooperate with Owner’s representatives by promptly responding to notification of warranty repairs or other corrective actions necessitated by work which is found to be defective or otherwise not to comply with Owner’s requests to participate in inspections at end of each time period of such continuing commitments.
- B. Participate in general inspection of the work approximately one year beyond date(s) of Substantial Completion, and promptly make corrections to any items noted.

END OF SECTION

**SECTION 2200  
EARTHWORK**

1. SCOPE: This section shall govern the furnishing of all labor, materials, tools, equipment, and of performing all operations required to do clearing, grubbing, drainage, excavation, filling, backfilling, and site grading.
  
2. CLEARING AND GRUBBING:
  - A. Areas on which construction is to be performed or on which fill is to be placed, shall be cleared of vegetation and rubbish. The roots of shrubs and trees shall be grubbed out.
  - B. The site shall be graded as shown on the plans. Where grading is not indicated on the plans, hillsides shall be graded to a stable slope and the site graded for drainage as in paragraph 3.0.
  - C. Salvage and stockpile topsoil for later installation on construction areas not otherwise covered by pavement, foundations or other structures.
  
3. DRAINAGE:
  - A. Excavation shall be performed in such a manner that the area of the site and area immediately surrounding, including slopes and ditches, will be continually and effectively drained. All excavations shall be kept dry by means of pumping or draining, where necessary. The Contractor shall be responsible for any and all damage resulting from dewatering, flushing, or draining of structures or excavations.
  - B. The slope and shape of drainage ditches shall be such as to minimize erosion and sedimentation.
  - C. Where natural topography of the area creates excessive slopes, ditches may be cascaded or lined.
  
4. EXCAVATION:
  - A. The Contractor shall perform excavation of every type of material encountered within the limits of the project and extend a sufficient distance to allow for placing and removing of forms, installation of piping and other work required for construction. Satisfactory excavation material free from waste, rubbish, trash, organic material, large rocks, waste concrete or other unsuitable material, shall be stored at the site for use as backfill. Any unsatisfactory material from excavation shall be transported from the site and disposed of as directed by the Consultant. Material required for fill or embankment in excess of that produced by excavation within grading limits shall be excavated from approved borrow areas.
  - B. The bottom of excavation shall be firm and capable of supporting the loads imposed on the soil. All excavation for major foundations shall be carried to solid ground regardless of depth specified on any drawing. No backfill shall be allowed on any major foundation excavation to meet required elevation except as specifically recommended in soil study, if a soils study has been conducted. Compacted fill shall be used for matching required elevations only where a small amount of settlement is not a major consideration.
  - C. Walls of excavations in earth not capable of self-support shall be adequately shored

or the excavation shall be enlarged so that loose earth does not infiltrate into space required for concrete, or produce a pressure on forms for concrete.

- D. Provisions shall be made for controlling water seepage into excavated areas by pumping, sheet piling, concrete seal coat or other suitable means depending on local field conditions.
  - E. Planning of foundation work shall be such as to minimize or eliminate the need for excavation adjacent to an already poured major foundation.
  - F. Excavation for concrete foundations, service pits, and other work shall be of ample dimensions to allow for forming of the concrete work if required.
  - G. Where excavation is required for many footings in a general area, the entire area may be excavated.
  - H. If underground obstructions are encountered which are not shown on the drawings, the Contractor shall request instructions from the Consultant before proceeding with the work.
  - I. Excavated material in excess of requirements for backfill shall be spoiled in the area and leveled for proper drainage as directed by the Consultant, Disposal of such materials shall be on the Owner's property.
  - J. Such deleterious materials, encountered during excavation, which may be deemed as unsuitable for surface soil shall be disposed of "off-site" at the Contractor's expense and as the Contractor's responsibility.
5. EXISTING STRUCTURES: Existing fences, buildings, and structures and/or utilities of any character, where so shown or noted on the drawings or designated by the Consultant, shall not be removed or disturbed by the Contractor, unless approved by the Consultant.
6. BACKFILL OR FILL:
- A. Excavated areas shall be backfilled to the grade designated on the engineering drawings.
  - B. Prior to deposition of backfill, all form lumber shall be removed from concrete surface.
  - C. Backfill material shall be obtained from excavated soil, surplus earth from grading or from a designated suitable source. No topsoil or material containing vegetation or other rotable material shall be used as backfill material.
  - D. Fill dirt shall be deposited in successive lifts, six inch maximum depth, with each lift spread and compacted to plan specified density as determined by ASTM Specifications until grade is firm, unyielding and shaped to the required contour.
  - E. All backfill material for structures or pipe shall be placed in uniform horizontal layers (not exceeding 12 inches in depth) and shall be compacted by pneumatic tamping to 90% maximum Standard Proctor Density, ASTM D-698. Material shall be approved by the Consultant.
7. DENSITY TESTING: Density shall be measured in the field in accordance with ASTM D1556, D2167, or D2922. "Maximum Density" shall mean the maximum dry density as

defined by ASTM D698. Density testing shall be performed by a commercial testing laboratory selected by the Consultant. The Owner shall pay for initial testing of compacted backfill for proper density as necessary. However, should the backfill fail to meet the minimum requirements of the specifications all subsequent testing for density shall be at the Contractor's expense. Tests performed for the convenience of the Contractor shall be at his own expense.

8. DISPOSAL:

A. Debris unearthed during excavation shall be disposed of "off-site" and shall be the responsibility of the Contractor.

B. Salvageable materials exposed during excavation shall be disposed of as directed by the Consultant. In all events, the Consultant shall determine which material shall be classed as salvageable and which shall be classed as debris.

9. FINAL SITE GRADING: Uniformly smooth grading of all areas on drawings in which finished contours and elevations are indicated, including excavated and filled sections, shall be accomplished. The finished surface shall be compacted, free from irregular surface changes, and reasonably smooth. The degree of finish shall be that ordinarily obtained from a machine graded operation except for sports fields and areas within 20 ft. of structures, which shall each be hand raked. Grading shall be such as to assure drainage away from the structures. Spread topsoil (salvaged and stockpiled at start of earthwork) to a depth of not less than four (4) inches over all bare earth, subsoil, and rock. Before completion and final acceptance, the Contractor shall refill and dress any area which has settled or washed away.

10. PAYMENT: Separate payment for work performed under this section of the specifications is provided only if a separate pay item is shown in the proposal. Otherwise it is considered subsidiary to other bid items and payment shall be made under the bid item to which it pertains.

END OF SECTION 2200

**Section 2221**  
**Excavation, Trenching, Bedding & Backfill**

**1. Scope of Work**

The contract work to be performed under this section of the specifications includes furnishing all labor, material, equipment, implements, transportation, supplies and supervision for performing all operations in connection with the excavation, trenching and backfilling for utilities. Items in this section shall be completed in accordance with the applicable specifications and drawings and be subject to terms and conditions of the Contract.

**1. General**

This item shall govern all excavation required for the construction of utilities, appurtenances and connections, and for the backfilling around completed pipes to the level of the original ground, all in conformity with the locations, lines and grades shown on the plans or as given by the Consultant and in accordance with these specifications. This item shall also govern the necessary pumping or bailing, drainage and all sheathing and bracing of trench walls. Unless otherwise provided, this item shall also govern the removal and disposal of tree stumps and other obstruction, abandoned structures or portions thereof (such as house foundations, old sewers, and sewer appurtenances), blocking of the ends of abandoned sewers cut and left in place restoration of existing utilities, pavements and base courses damaged in the process of excavation, furnishing and placing of stabilized backfill, hauling and disposition of surplus materials, bridging and trenches and other provisions for maintenance of traffic or access as provided herein.

**3. Trenches**

Unless otherwise specified on the Plans or permitted by the Consultant, all utility lines shall be constructed in open cut trenches with vertical sides. Trenches shall be sheathed and braced to the extent necessary to maintain the sides of the trench in vertical position throughout the construction period. Adequacy of the sheathing and bracing shall be the responsibility of the Contractor but will be subject to the approval of the Consultant. Trench safety systems are to be used as required by law.

The trench bottom shall be continuous, relatively smooth and free of rocks and shall be constructed to provide a firm stable and uniform support for the full length of the pipe. Bell holes shall be provided at each joint to permit proper joint assembly and alignment.

**4. Backfill**

Trenches shall be backfilled with materials selected from the trench excavation or obtained from other sources, which is free from stones of such size as to interfere with compaction and is free from large lumps which will not break down readily under compaction. The Consultant shall have the right to reject any material retained on a 3 inch sieve, or material excavated in such a manner as to produce large lumps not easily broken down or which cannot be spread in loose layers. In general, material excavated by means of a trenching machine will meet the requirements above, provided large stones are not present.

The pipe shall be uniformly and continuously supported over its entire length on firm, stable material. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections.

After the bedding has been prepared and the pipes installed as required by the pertinent

specifications, selected materials from excavation or borrow shall be placed along both sides of the pipe equally in uniform layers not exceeding 6 inches in depth (loose measurement). If required, the backfill may be wetted and thoroughly compacted. Each side of the pipe shall be supported by a berm of thoroughly compacted material at least as wide as the external diameter of the pipe, except insofar as undisturbed material protrudes into this area.

Filling and/or backfilling shall be continued in this manner to a point at least 6 inches over the top of the pipe. Special care shall be taken to secure thorough compaction of the materials placed under the haunches of the pipe. All fill or backfill below the top of pipe shall be compacted in the manner prescribed.

**SECTION 02230  
SITE CLEARING**

**PART 1        GENERAL**

1.01    SECTION INCLUDES

- A.    Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
- B.    Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.
- C.    Stripping topsoil from areas that are to be incorporated into limits of project and storage of topsoil where so indicated on Construction Drawings.

1.02    RELATED SECTIONS

- A.    Section 02220 - Earthwork
- B.    Section 02325 - Aggregate Materials
- C.    Section 0301 -Site Preparation and Erosion Control and Sedimentation
- D.    Storm Water Pollution Prevention Plan (SWPPP)
- E.    Construction Drawings

1.03    ENVIRONMENTAL REQUIREMENTS

- A.    Construct temporary erosion control systems as shown on Construction Drawings or as directed by the "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.
- B.    In event that sitework on this project will disturb one or more acres; Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.
- C.    Contractor shall be totally responsible for conducting storm water management practices in accordance with NPDES permit and for enforcement action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.04    PROJECT CONDITIONS

- A.    Existing Conditions at time of inspection for bidding purposes will be maintained by Owner in so far as practical.
- B.    Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to attention of Owner prior to commencement of sitework.

**PART 2        PRODUCTS**

1.01    EQUIPMENT

- A.    Off-site materials shall be transported to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

## **PART 3      EXECUTION**

### **3.01      PREPARATION**

- A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their safety throughout construction operations.

### **3.02      PROTECTION**

- A. Locate and identify existing utilities that are to remain and protect these from damage.
- B. Protect trees, plant growth, and features designated to remain as part of final landscaping.
- C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by SWPPP or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.
- D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, in kind.
- E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

### **3.03      CLEARING**

- A. Clear areas required for access to site and execution of work.
- B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section 02300.
- C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

### **3.04      TOPSOIL EXCAVATION**

- A. Topsoil shall consist of organic surficial soil found in depth of not less than 6-inches. Satisfactory topsoil shall be reasonably free of subsoil, clay lumps, stones and other objects over 2-inches in diameter, weeds, roots, and other objectionable material.
- B. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

**SECTION 02231**  
**SUBGRADE PREPARATION AND COMPACTION**

1. DESCRIPTION: This section shall govern the scarifying, blading and rolling of the subgrade to obtain uniform texture and density throughout the required depth as shown on the Plans.
2. CONSTRUCTION METHODS: The subgrade, under any structure to be constructed under this contract shall be excavated and shaped in conformity with the typical sections shown on the Plans and to the lines and grades established by the Consultant. All unstable or otherwise objectionable material shall be removed or broken off to a depth of not less than six inches below the surface of the subgrade. Holes or depressions resulting from the removal of such material shall be backfilled with suitable material compacted in layers not to exceed six inches. All soft and unstable material and other portions of the subgrade which will not compact readily or serve the intended purpose shall be removed as directed.

The subgrade shall be scarified, bladed and compacted in the manner directed in the paragraph on "Finishing and Compaction." The surface of the subgrade shall be finished to line and grade as established, and be in conformity with the typical sections shown on the Plans. Any deviation in excess of one-half inch in cross section and in a length of sixteen feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and compacting by sprinkling and rolling. Material excavated in the preparation of the subgrade shall be disposed of as directed by the Engineer.

3. FINISHING AND COMPACTION: The subgrade course, including an area one foot back of the proposed construction line, shall be sprinkled as required and rolled until a uniform compaction and the required density is obtained. Compaction of the subgrade may be done using any suitable rolling equipment. However, required densities must be met. Should the Consultant feel that too much time is being required to obtain those densities he can require that a heavy pneumatic roller be applied. Rolling shall continue until the subgrade has been compacted to ninety-five (95%) percent of the Modified A.A.S.H.O. Density (A.S.T.M. Method D-1557) within three percent of optimum moisture content unless otherwise shown on the plans. Failing density tests will be retested at Contractor's expense.

Rolling shall progress gradually from the sides of the center of the lane under construction by lapping uniformly each proceeding track by at least twelve inches. After rolling and watering, the subgrade shall be checked by the use of string line or instrument and all portions that do not conform to the lines and grades as shown on the Plans shall be scarified for at least six inches, corrected and re-compacted to correct elevation.

Until the subgrade is covered, the subgrade shall be maintained free from cuts and depressions, in a smooth and compacted condition true to lines and grade and to the density requirements contained herein. All of the Contractor's hauling and other equipment used in such a way as to cause rutting and raveling of the subgrade shall either be removed from the work or suitable run-ways or other equivalent means shall be provided to prevent rutting.

The Contractor shall be responsible for maintaining and protecting the subgrade for the entire length of the project.

During construction grading of the subgrade shall be conducted so that berms of earth or other material do not prevent immediate drainage of water away from the work. Ditches and drains along the subgrade shall be maintained so as to drain effectively.

4. BASIS OF PAYMENT: If a bid item is included, subgrade preparation will be paid by the square foot, otherwise, subgrade preparation and compaction will not be paid for directly, but will be considered subsidiary to the project bid, which price will be full compensation for removing excess material, shaping, fine grading and compacting the subgrade; for furnishing and hauling all materials, blading, shaping, rolling and finishing, and all labor, tools and incidentals necessary to complete the work. Payment will not be made for unauthorized work.

END OF SECTION

**Section 02322**  
**Excavation, Backfill, and Compaction for Utilities**

**PART 1**

**1.01 SECTION INCLUDES**

- A. Excavation of trenches for installation of utilities.
- B. Backfilling trenches with bedding material as specified and filling trenches with suitable material to proposed subgrade.
- C. Compacting backfill materials in acceptable manner.
- D. Borings and casings under roads.

**1.02 RELATED SECTIONS**

- A. Section 02300 - Earthwork
- B. Section 02630 - Storm Drainage
- C. Construction Drawings

**1.03 REFERENCE STANDARDS**

See Related Sections

**1.04 QUALITY ASSURANCE**

- A. An independent testing laboratory will perform testing at intervals not exceeding 200 feet of trench for first and every other 8 inch lift of compacted trench backfill and furnish copies of results as specified herein.
- B. Testing shall be in accordance with Part 3, Section 3.07, "Field Quality Control".

**1.05 SUBMITTALS**

- A. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to Construction Drawings or specifications are proposed. Do not perform work until Owner has accepted required shop drawings.
- B. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.
- C. Submit 30-pound sample of each type of off-site fill material that is to be used in backfilling in air-tight container(s) to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

**1.06 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual locations of subsurface utilities, structures, and obstructions installed or encountered.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Bedding Material: As indicated on the construction plans.
- B. Haunching Material: As indicated on the constructions plans.
- C. Backfill material from the site as specified on the construction plans.
- D. Backfill material from off-site as specified on the construction plans.
- E. Steel Casing Pipe: comply with AWWA C200 minimum grade B, size, and wall thickness as

indicated on Construction Drawings.

- F. Backfill material shall not contain rock or stone with a maximum size greater than 2 inches.

## 2.02 LOCATOR TAPE

- A. Locator tape shall be heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3', which ever is the lesser, but never above the tope of subgrade. Color of tape shall be determined by APWA Color Standards: Natural Gas or Propane - Yellow, Electric - Red, Telephone - Orange

## 2.03 EQUIPMENT

- A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

# PART 3 EXECUTION

## 3.01 PREPARATION

- A. Set lines, elevations, and grades for proposed systems.
- B. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.
- C. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on Construction Drawings.
- D. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on Construction Drawings.
- E. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or additional bedding material placed and compacted as specified in Section 02340.
- F. Provide dewatering systems as required for utility excavations. Dewatering shall comply with requirements of Section 02300.

## 3.02 EXCAVATION

- A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.
- B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.
- C. Perform excavation as indicated on Construction Drawings for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.
- D. Remove excavated materials not required or not suitable for backfill or embankments and waste off-site or at on-site locations approved by the Owner and in accordance with governing regulations. Dispose of structures discovered during excavation as specified in Section

02220.

- E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified in Section 02300.
- F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.
- G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.
- H. Trench width below top of pipe shall not be less than 12-inches or more than 18 inches wider than outside surface of pipe or conduit that is to be installed to designated elevations and grades. Other trench width for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.
- I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent:
  - 1. Water Mains: 30 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.
  - 2. Sanitary Sewer: Elevations and grades as indicated on Construction Drawings.
  - 3. Storm Sewer: Elevations and grades as indicated on Construction Drawings.
  - 4. Electrical Conduits: 24 inches minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.
  - 5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company whichever is deeper.
  - 6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
  - 7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

### 3.03 PIPE BEDDING

- A. Accurately cut trenches for pipe or conduit that is to be installed to designated elevations, 4-inches below bottom of pipe and to the width as specified herein. Place 4-inches of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel.
- B. Place geotextile fabric as specified on Construction Drawings and in accordance with Section 2340.

### 3.04 BACKFILLING

- A. Criteria: Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified in Sections 02300 and one or more of the following sections, as applicable: 2323 for trenches below pavements. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified herein, to properly correct the condition in an acceptable manner.
- B. Backfilling: After pipe or conduit has been installed, bedded, and tested as required, backfill trench or structure excavation with specified material placed as given in the Construction Documents.
- C. Backfill trenches to contours and elevations shown on Construction Drawings with unfrozen materials.
- D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

### 3.05 COMPACTION

- A. Exercise proper caution when compacting immediately over top of pipes or conduits. Water

jetting or flooding is not permitted as method of compaction.

- B. Maintain optimum moisture content of fill materials as specified in Section 02300 to attain required compaction density.
- C. Materials used for backfill shall comply with requirements of Section 02325 and as specified herein.

3.06 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS, AND RAILROAD CROSSINGS

- A. When indicated by Construction Drawings, street, road, highway, or railroad crossings for utility mains installed by jacking and boring method shall be in accordance with area specifications and governing authorities.
- B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6-inches thick for entire length and depth of trench or pit. Compact backfill to 98 percent of maximum density in accordance with ASTM D698, (or 95 percent of maximum density, in accordance with ASTM D1557) obtained at optimum moisture as determined by AASHTO T 180. Mechanical tampers may be used after cover of 6-in. has been obtained over top of barrel of pipe.
- C. Accomplish boring operation using commercial type boring rig. Bore hole to proper alignment and grade. Bore hole shall be within 2-inches of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made and in no instance shall hole be left unattended while open.
- D. In event subsurface operations result in failure or damage to pavement or railroad tracks within 1 year of construction, make necessary repairs to pavement or railroad tracks at no additional cost to Owner.
- E. Clean, prime and line interior and exterior of casing pipe with two coats of asphalt in accordance with area specifications and governing authorities.
- F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C206 and AWS D7-0-62.
- G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.07 FIELD QUALITY CONTROL

See Section 02300, 3.08 "Field Quality Control".

**END OF SECTION 02322**

## SECTION 02325

### AGGREGATE MATERIALS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Aggregate materials.

##### 1.2 RELATED SECTIONS

- A. Section 01400 - Quality Control
- B. Section 02205 - Soil Materials.
- C. Section 02224 - Excavation, Backfilling, and Compacting for Structures.

##### 1.3 REFERENCES

- A. ASTM C29 - Unit Weight of Aggregate
- B. ASTM C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C. ASTM C117 - Materials Finer than 75um (No. 200) Sieve in Mineral Aggregates by Washing
- D. ASTM C131 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
- E. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- F. ASTM D75 - Sampling Aggregate
- G. ASTM 0693 - Crushed Stone, Crushed Slag, and Crushed Gravel for Dry-or Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavements
- H. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- I. ASTM D2419 - Sand Equivalent Value of Soils and Fine Aggregate
- J. ASTM D2487 - Classification of Soils for Engineering Purposes.
- K. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

- L. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- M. ASTM D3665 - Random Sampling of Paving Materials
- N. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- O. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition.

#### 1.4 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Samples: Submit, in air-tight containers 10 lb. sample of each type of material to testing laboratory.

#### 1.5 SUBMITTALS FOR INFORMATION

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Materials Source: Submit name of imported materials suppliers.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with plans and specification requirements and TxDOT standards.

### PART 2 PRODUCTS

#### 2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1 - Drain Rock:
  - 1. As shown on the Drawings, under structures and behind walls shall be clean, washed, sound durable, well-graded crushed rock, crushed gravel or natural stone gravel.
  - 2. Conforming to ASTM C-33 Size No. 57 coarse aggregate between 1inch and 2 inch.
- B. Coarse Aggregate Type A2 - Pipe Embedment:
  - 1. Angular 3/4 inch to 1 inch crushed rock or natural stone meeting the requirements of ASTM C-33 No. 57.

2. Embedment material shall be clean, washed, sound, durable and well graded.
- C. Coarse Aggregate Type A3 - Foundation Material:
1. Coarse stone or crushed gravel.
  2. Foundation material shall be pit run angular crushed, natural washed stone free of shale, clay, friable material and debris; well graded between 1 and 3 inches in size, with a minimum of 90% retained on a 1-inch sieve.
- D. Coarse Aggregate Type A3-1- Foundation Material for Unsuitable Subgrade:
1. Foundation material shall conform to the specification for TxDOT Item 247, Type "A", Grade 2.
- E. Aggregate Type A4 - Pea Gravel:
1. Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136 to the following limits:
    - a. Minimum Size: 1/4 inch
    - b. Maximum Size: 5/8 inch
- F. Aggregate Type AS - Type "R" Modified Rock Riprap:
1. Natural stone, washed free of clay and shale, and shall meet all of the requirements of TxDOT Item 432, for Type R Stone Riprap with the following modifications:
    - a. Stones shall weigh between 50 to 100 pounds with no less than 50 percent of the stones shall weigh more than 100 pounds.
    - b. Rock's longest dimension shall not exceed 3 times that of the shortest dimension.
    - c. Delete paragraphs 432.5 Measurement and 432.6 Payment, and refer to Section 01200 – Unit Bid Prices of these specifications.

## 2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type AS - Sand:
1. Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials and organic matter; graded in accordance with

ASTM C136; within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0 to 10

### 2.3 SOURCE QUALITY CONTROL

- A. Section 01400 - Quality Control: Source testing and analysis of aggregate material.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, and ASTM C33.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, and ASTM C33.
- D. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- E. Provide materials of each type from same source throughout the Work. A change in source requires sampling, testing, and approval by the Engineer.

## PART 3 EXECUTION

### 3.1 STOCKPILING

- A. Stockpile materials on site at locations designated by the Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

### 3.2 STOCKPILE CLEANUP

- A. Remove stockpile; leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.
- B. Leave unused materials in a neat, compact stockpile.
- C. If a borrow area is indicated, leave area in a clean and neat condition.
- D. Grade site surface to prevent freestanding surface water .

END OF SECTION

**SECTION 2590**  
**JOB CLEAN UP**

1. DESCRIPTION: After construction work has been completed, there shall be removed from the job site all debris, trash, excess materials, equipment, etc., occasioned by the work and the construction site shall be left in a neat appearing and workmanlike condition before final acceptance. All excess excavated materials are to be disposed of as directed. Waste heaps will be permitted only as directed. Where the construction covers a considerable area as a water line or sewer line, the Contractor shall at the direction of the Consultant cleanup the streets and/or alleys and leave them in a usable condition as the job progresses.
  
2. BASIS OF PAYMENT: Payment for cleaning up will be included in the unit price bid for the particular part of the work that necessitates the cleaning up. No other payments will be made

END OF SECTION

**SECTION 02710**  
**SIGNAGE**

**PART 1 - GENERAL**

- 1.01 SCOPE: Work in this section includes furnishing all labor, materials, equipment and services required to install entry sign, construction sign, handicap parking signage and interpretive signage where field approved.

**PART 2 - PRODUCTS**

- A. Construction sign design to be provided by the Landscape Architect but produced and installed by the Contractor. The sign size will be 4' by 8' and suitable for mounting on two 4" x 4" x 8' length treated wood posts. This will be a sign that includes text as shown on the plans. Final location for sign installation to be field approved.
- B. Handicap signage shall meet all applicable design standards.
- C. Park entry sign and interpretive signs to be typical to details on the plans.

**PART 3 - EXECUTION**

- A. After thorough examination of the site and the Contract Documents, Contractor shall verify the overall design intent for all sign placements and adjust to site and applicable safety conditions.
- B. Submit any essential Shop Drawings and product samples for project signs (construction, parking and directional signs) and receive Owner approvals prior to fabrication.
- C. Stake all sign locations for review and approval by Owner prior to installation.
- D. Construction sign to be maintained in place throughout construction. Sign to be plumb, securely anchored and properly cleaned at all times.

END OF SECTION

## SECTION 02800 TRAIL SYSTEM

1. GENERAL: Contractor shall furnish all labor, material, equipment, and supervision to install a trail system as shown on the plans, complete and in place. Work shall include clearing and grubbing the full width of the trail plus eight feet on each side or as indicated on the plans.
2. MATERIALS: Materials and proportions used in construction under this item shall conform to the requirements as specified on the plans and as further described in other related sections of these specifications.
  - a. Concrete trails: Section 3010 "Concrete for Structures".
  - b. Asphalt trails: Section 2503 "Hot Mix Asphaltic Concrete" or Section 02510 "One Course Surface Treatment".
  - c. Flexible base trail: Section 2233 "Flexible Base".
  - d. Decomposed Granite Trails: Section 2203 "Untreated Compacted Aggregate Tread Material".
3. CONSTRUCTION METHODS:
  - a. Unless otherwise noted on the plans clear and grub lines as marked by the Consultant to a distance of 8-feet each side of the improved trail. Remove overhanging branches to a height of 10-feet above any part of the final improved surface. Saw branches up to 3-inches diameter all the way back to the trunk or major branch higher than 10-feet above the trail. Saw larger branches back to the limits of clearing.
  - b. The subgrade shall be excavated and shaped to line, grade and cross-section and if considered necessary in the opinion of the Consultant, mechanically tamped, rolled, and sprinkled. Unless otherwise specified compaction shall be "ordinary" compaction and not "density controlled" compaction.
  - c. Forms shall be of wood or metal, of a section satisfactory to the Consultant, free from warp, and of a depth equal to the thickness of the finished work. They shall be securely staked to line and grade and maintained in a true position during the depositing of specified trail material. Curves shall be placed smoothly without angle points and straight sections shall show no deflection. Likewise, grade changes shall be made gradually without points of inflection.
  - d. No trail material shall be placed until the forms and subgrade have been approved by the Consultant. Finished trails may not have raised or offset joints, surface imperfections, or loose materials which may pose a hazard to trail users. Slopes shall be gentle, generally conforming to the slope of the land. No running slope shall exceed 5%. No side-to-side slope shall exceed 2%. Water shall not pond on trail surfaces. Concrete trails shall have a light broom finish. Unless otherwise shown on the plans, concrete trails shall have expansion joints every 50 feet and sawn crack control joints every eight feet and all exposed edges shall be tooled smoothly.
  - e. Remove all surplus construction materials. Hand grade disturbed soil next to the trail removing all clods and rocks. Areas bordering trails shall be backfilled or cut to 1-1/2-inches below trail surface with suitable topsoil. Repair all access routes disturbed during construction.
4. MEASUREMENT: Work and accepted material as prescribed for this item will be measured by the square yard of surface area of completed trail system. If hot mix asphalt or one course surface treatment is specified over a flexible gravel base, surface and base will be measured together and paid for per square yard of trail - not as separate pay items.

5. BASIS OF PAYMENT: The work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price set forth in the proposal which prices shall be full compensation for clearing, preparing the subgrade; for furnishing and placing all materials, including all expansion joint materials; cleanup, and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work.

END OF SECTION 2800

**SECTION 2810**  
**IRRIGATION SYSTEM**

**PART I**    GENERAL

**1.01**    RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and all applicable specification sections, apply to this section.

**1.02**    DESCRIPTION

- A. This Section specifies the requirements for providing the irrigation system as indicated on the Drawings.
- B. Contractor shall provide irrigation system as a complete system including but not limited to: heads, valves, valve boxes, control wire splice boxes, control wiring, electric controller, piping circuits, backflow preventor, including electric power source coordination and installation.

**1.03**    QUALITY ASSURANCE

- A. Available Manufacturers - Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in the Work are included in the specifications or denoted on the Drawings.
- B. Installer - Installation of Irrigation System shall be performed under the direction of a State of Texas licensed irrigator with not less than 5 years experience in this type of work.
- C. Reference Standards Applicable to this Section:
  - 1. ANSI: American National Standards Institute
    - a. Z55. 1: Gray Finishes for Industrial Apparatus and Equipment
  - 2. ASTM: American Society for Testing and Materials
    - a. B88: Specifications for Seamless Copper water tube.
    - b. D 1785: Specifications for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40,80, and 120.
    - c. D 2241: Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
    - d. D 2466: Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
    - e. D 2564: Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
    - f. F 690: Practice for Underground Installation of Thermoplastic Pressure Piping Irrigation Systems
  - 3. AWWA: American Water Works Association
    - a. C 500: Gate Valves, 3 inches through 48 inches NPS, for Water and Sewage Systems.
    - b. C 506: Backflow Prevention Devices, Reduced Pressure Principle and Double Check Valve Types
  - 4. IAMPO: International Association of Plumbing Mechanical Officials
    - a. UBC: Uniform Building Code
  - 5. NEMA: National Electrical Manufacturer's Assoc.
    - a. 250: Enclosures for Electrical Equipment (1000 Volts Maximum)
  - 6. NFPA: National Fire Protection Association

- a. NFPA 70 (NEC): National Electric Code
- 7. Uniform Plumbing Code
- 8. NSF: National Sanitation Foundation
  - a. No. 14 - Plastic Piping System Components and Related Materials

#### 1.04 SUBMITTALS

##### A. Product Data

1. Submit manufacturer's technical data, specifications, shop drawings, and installation instructions for sprinkler heads, automatic valves, controllers, backflow preventers, connections, details, and related items.
2. Submit manufacturer's operating instructions and a schedule indicating length of time each valve is to be open to produce a given amount of precipitation.
3. Submit maintenance instructions on all items requiring manufacturer's standard detail submittal.

B. Spares and Special Tools - Provide Owner with 2 spare sprinkler heads of each size and type. In addition, see Section 2.17E.

C. Water Tap Connections - All fees will be part of this contract by Contractor.

D. Water - Recycled water to be supplied by Owner. Contractor shall make provisions for all connections required.

#### 1.05 PRODUCT DELIVERY AND HANDLING

A. Materials shall be delivered in manufacturer's unopened packaging labeled to indicate manufacturer's name and product identification. Insure that packaging and labeling remain intact until installation. Materials shall be stored protected from the elements, including direct sunlight.

B. Pipes shall be handled so as to prevent being damaged and to maintain their straightness. Pipe ends shall be wrapped. Pipes shall be stored on beds the full length of the pipes. Damaged or dented pipes or fittings shall not be used.

#### 1.06 DEFINITIONS

A. Irrigation Main - Irrigation main is the piping from the water source to control valves. Irrigation main is that pipe which is on the pressure side of irrigation control valves.

B. Irrigation Lateral Lines - Irrigation lateral line is the piping from the control valves to the irrigation heads. Lateral line is that pipe which is on the nonpressure side of irrigation control valves.

### PART 2 PRODUCTS

#### 2.01 PIPES

A. Markings - Thermoplastic pipes should be marked in accordance with ASTM D 1785 and ASTM D 2241 as applicable and shall bear the NSF mark in accordance with NSF 14.

B. Irrigation Main Pipe - ASTM D 223 1, PVC, 1120 or 1220, Schedule 40.

C. Irrigation Lateral Line Pipe

1. Pipes 3/4 inch diameter and larger: ASTM D 223 1, PVC, 1120 or 1220, SDR 21.0, 200 PSI
2. Pipes 1/2 inch diameter: ASTM D 2241, PVC, 1120 or 1220, SDR 13.5, 315 PSI

D. Copper Tubing - ASTM B 88, Type K

E. Non-potable water irrigation systems shall use purple pipe.

1. All recycled water piping shall use purple colored and stenciled pipe, purple recycled water warning tape continuously applied to the pipe, or marked plastic encasement. All marking shall include the following or similar words: "Caution: Recycled Water – Do not Drink".

## 2.02 FITTINGS FOR SOLVENT WELDED JOINTS

A. Schedule 40: ASTM D 2466 - Pipes less than 2 1/2" diameter

B. Schedule 80: ASTM D 2467 - Pipes 2 1/2" diameter and larger

## 2.03 SOLVENT CEMENT FOR SOLVENT WELDED JOINTS

A. CHRISTY'S RED HOT BLUE GLUE T. Christy Enterprises, Inc., 1207 W. Struck Ave., No. E., Orange, CA 92667, 1-800-258-4583, or approved equal. Use a compatible primer recommended by the solvent cement manufacturer.

## 2.04 FITTINGS FOR THREADED JOINTS

A. ASTM D 2466, PVC, Schedule 80.

## 2.05 SEALANT FOR THREADED JOINTS UNDER CONSTANT PRESSURE

A. RECTOR SEAL LIQUID TEFLON by Rector Seal Corp., 2830 Produce Row, Houston, Texas 77023, (713) 928-6423, or approved equal.

## 2.06 SLEEVES UNDER PAVING FOR CONTROL WIRE AND IRRIGATION LINES

A. ASTM D 2466, PVC, Schedule 40, sized as shown on drawings.

## 2.07 IRRIGATION SPRINKLERS

A. Pop-Up Spray Sprinklers

1. Shall be heavy duty plastic pop-up to specified height with appropriate nozzle as indicated on Drawings.
2. Irrigation head body, stem, nozzle, and screen shall be constructed of heavy duty plastic.
3. Head shall have wiper seal for cleaning debris as it retracts into case.
4. Plastic nozzles shall have matched precipitation rate with an adjusting screw capable of regulating the radius and flow.
5. Head shall have stainless steel retroactive spring.
6. Head shall have filter screen under nozzle.
7. Head shall have side and bottom inlet on rocketing system for easy alignment of pattern on 6 inch and 12 inch pop-ups.
8. The nozzles on pop-up spray head body shall be as shown on Drawings and shall be capable of covering the radius as designated on Drawings. Nozzles in same series shall have matched precipitation rates.
9. Heads shall be connected to irrigation lateral lines by swing joints as indicated.

Flexible PVC shall not be accepted as a swing joint.

B. Gear Driven Sprinklers

1. The pop-up rotor sprinklers shall be a gear driven sprinkler. The part circle sprinklers shall have an infinitely adjustable arc of coverage from 40° to 360°.
2. The sprinkler case and internal assembly, except for the arm spring, bearing spring, wiper seal and bearing washers, shall be constructed of durable plastic.
3. The sprinkler shall have an adjustable nozzle-retainer/range adjustment screw for distance and distribution control and shall be capable of full or part circle operation as noted on Drawings.
4. The sprinkler shall have a 4" pop-up stroke, turbine bypass valve, fine mesh filter screen, and the gear drive shall be sealed in oil.
5. Plastic nozzles shall be color coded and interchangeable for matched precipitation.
6. All sprinklers used in recycled water facilities shall have an exposed surface colored purple to associate them with recycled water use. The exposed surface may be colored purple through the use of: (1) dyed plastic or rubber, or (2) weatherproof paint.

2.08 ELECTRIC REMOTE CONTROL VALVES

A. Electric remote control valves shall be as specified on Drawings.

1. Remote control valves shall be normally closed, 24 volt AC 60 Cycle, solenoid actuated globe pattern diaphragm. Valve pressure rating shall be 200 psi minimum.
2. Valve body and bonnet shall be constructed of heavy duty glass-filled nylon. Diaphragm shall be nylon reinforced rubber. Solenoid coil shall be encapsulated in molded epoxy.
3. Valve shall be actuated by a low power, 20 watt 24 volt AC Solenoid.
4. Valve shall have a flow control stem with wheel handle for regulating or shutting off flow of water and a bleed plug for manual operation.
5. All valve integral parts shall be removable from top of valve without disturbing the valve installation.
6. All sprinklers used in recycled water facilities shall have an exposed surface colored purple to associate them with recycled water use. The exposed surface may be colored purple through the use of: (1) dyed plastic or rubber, or (2) weatherproof paint.

2.09 REMOTE CONTROL VALVE TIES

A. Remote control valve ties shall be plastic tags with wire to attach numbered tag to valve.

- B. Install warning tags as manufactured by T. Christy Enterprises 3150 or equivalent to all such control valves, gate valves, quick coupler valves, controllers, meters, etc. Tags shall be weatherproof plastic, 3-inch by 4-inch, purple in color with the words "Warning: Recycled Water – Do Not Drink" imprinted on one side and "Aviso: Aqua Impura – No Tomar" on the other side, or similar as approved by the District Engineer. Imprinting shall be permanent and black in color.

2.10 VALVE BOXES

- A. Valve boxes shall be heavy duty plastic 17 inch by 11-3/4 inch by 12 inch depth, black with black cover. Valve box shall be Series 1419, non-hinged, non-bolt cover, by Carson Industries, Inc., 1925 Street, LaVeme, CA 91750, (213) 732-6265, or approved equal.

- B. Install valves, meters and appurtenances in purple colored valve boxes with purple lids. The valve box lid shall have the following warnings molded or hot-stamped upon it: "RECYCLED WATER", or use warning label by T. Christy Enterprises 3800 or equal.

#### 2.11 CONTROL WIRE SPLICE BOXES

- A. Control wire splice boxes shall be heavy duty plastic 10 inch diameter by 10-1/4 inch deep, black with black cover, No. 910-10B, by Carson Industries, Inc. or approved equal.

#### 2.12 GRAVEL BACKFILL

- A. Gravel backfill for valve boxes and control wire splice boxes shall be 3/8 inch diameter pea gravel.

#### 2.13 ELECTRIC CONTROLLER(S)

- A. Controller(s) shall be as specified on drawings.
  1. Controller shall be capable of fully automatic or manual operation of the system.
  2. Controller shall operate on a minimum of 117 volts A.C. input power and be capable of operating 24 volt A.C. electric remote control valves. Controller shall have a reset circuit breaker to protect it from power overload.
  3. The controller shall have the specified number of stations. Each station shall have a time setting knob capable of being set for incrementally variable timing or set to omit the station from the irrigation cycle.
  4. Controller shall have a 24-hour digital clock.
  5. Controller shall have a UL-listed 24V AC transformer. All station wiring shall be color-coded with section indicator key visibly imprinted.
  6. Operation instructions and location of water source supplying system shall be printed on face of controller. Section location chart shall be placed inside cabinet door.
  7. Controller shall have a weather station with wind, rain & freeze sensors.

#### 2.14 IRRIGATION CONTROL WIRE

- A. Wire: Solid copper wire, NEC type UF, UL listed for direct burial in ground. Minimum size: No. 14 AWG.
- B. Splicing Material: Scotchlok connector with No. 3570/Scotchlok Connector Sealing Packs by Electro-Products Division/3M, Minneapolis, Minnesota, Rain Bird Snap-Tites by Rain Bird Sprinkler Manufacturing Corporation, or approved equal. Use separate packs for each splice.

#### 2.15 BACKFLOW PREVENTER

- A. Backflow Preventers shall be bronze and copper, reduced pressure backflow assembly Febco No. 850 by Febco Sales, Inc. (CMB Industries), P.O. Box 8070, Fresno, CA 93747, (209)252-0791, or approved equal. Size as per drawings or as needed for proper operation.

#### 2.16 GATE VALVES

- A. Gate Valves shall comply with AWWA C-500, Valves up to 3 inch size shall be 125 pound, bronze body, bronze-mounted, non-rising stem with solid wedge gates.
- B. Install warning tags as manufactured by T. Christy Enterprises 3150 or equivalent to all such control valves, gate valves, quick coupler valves, controllers, meters, etc. Tags shall be weatherproof plastic, 3-inch by 4-inch, purple in color with the words "Warning:

Recycled Water – Do Not Drink" imprinted on one side and "Aviso: Aqua Impura – No Tomar" on the other side, or similar as approved by the District Engineer. Imprinting shall be permanent and black in color.

## 2.17 QUICK COUPLING VALVES

- A. Quick coupling valves shall have heavy duty brass construction, durable thermoplastic rubber cover, stainless steel internal valve spring, one-piece body design, as indicated on drawings.
- B. Provide four valve keys as shown on the plans.
- C. Install warning tags as manufactured by T. Christy Enterprises 3150 or equivalent to all such control valves, gate valves, quick coupler valves, controllers, meters, etc. Tags shall be weatherproof plastic, 3-inch by 4-inch, purple in color with the words "Warning: Recycled Water – Do Not Drink" imprinted on one side and "Aviso: Aqua Impura – No Tomar" on the other side, or similar as approved by the District Engineer. Imprinting shall be permanent and black in color.

## PART 3 EXECUTION

### 3.01 SYSTEM DESIGN

- A. Design Pressures - Pressure shall be as indicated on Drawings, and as measured at last head in circuit.
- B. Location of Heads - Design location is represented as accurately as possible. Make minor adjustments on site with approval of Consultant as necessary to ensure consistent and even spacing where applicable. Set all heads minimum 6" from back of curb and 4" from edge of concrete walls.

### 3.02 TRENCHING AND BACKFILLING

- A. General - Contractor shall comply with Section 02221 Excavation, Trenching, Bedding & Backfilling and Section 02200 Earthwork of these Specifications. Excavate straight and true with bottom uniformly sloped to low points. Protect existing lawns and plantings. Remove and replant as necessary to complete installation. Replace damaged lawn areas and plants with new products to restore to existing installation's original condition.
- B. Minimum Cover - Provide 18 inch minimum cover over top of installed irrigation main piping. Provide 12 inch minimum cover over top of installed irrigation lateral line piping. Provide 2 inches of earth between parallels and wire. Parallels shall be laid side-by-side, not stacked.
- C. Backfill - Backfill with clean material from excavation after obtaining Consultant's approval. Remove organic material, as well as rocks and debris larger than 1 inch in diameter. Place acceptable backfill in 6 inch lifts and water jet all trenches.
- D. Existing Lawns - Where trenching is required across existing lawns, (or in event of changes or repairs after new lawn has been established), uniformly cut strips of sod 6 inches wider than trench. Remove sod in rolls of suitable size for handling and keep moistened until replanted.
  - 1. Backfill trench to within 6 inches of finished grade and compact. Continue fill with acceptable topsoil and compact to bring sod even with existing lawn.

2. Replant sod within 2 days after removal, roll and water generously.
3. Resod and restore to original condition all sod areas not in healthy condition equal to adjoining lawns 30 days after replanting.

### 3.03 INSTALLATION

A. General - Unless otherwise indicated, Contractor shall comply with requirements of the Uniform Plumbing Code, latest edition, City Plumbing Code, and ASTM F 690.

#### B. Pipes

1. Piping Mains and Laterals - Lay out sprinkler mainlines and perform line adjustments and site modifications to laterals prior to excavation. Lay pipe on solid subbase, uniformly sloped without humps or depressions.
2. PVC Pipe Assembly
  - a. Cut PVC pipe square and de-burr. Clean pipe and fittings using primer as recommended by the PVC pipe manufacturer. Use purple tinted primer to aid in visual inspection.
  - b. Apply a thin even flow coat of PVC solvent cement to inside of the fitting and pipe mating surface. Cure joints as recommended by the manufacturer and keep pipe and fitting out of service during curing period. Construct watertight joints equal or greater in strength than the pipe. Do not tap pipe at fittings.
3. Install plastic pipe in dry weather, when temperature is above 40 degrees F. and in accordance with manufacturer's written instructions. Allow joints to cure at least 24 hours at temperature above 40 degrees F. before testing.
4. Plastic pipe shall be snaked in the trenches in a manner to provide for expansion and contraction as recommended by pipe manufacturer.

C. Sleeves Under Paving - The majority of sleeves under paving are existing as shown on drawings. Where boring is required for new sleeves (refer to drawings), it shall be a "wet bore." Install sleeves 12" beyond edge of pavement. Perform trench and backfill in accordance with these specifications.

#### D. Irrigation Heads

1. Flush irrigation lines with full head of water and install heads after hydrostatic test is completed.
2. Install heads at manufacturer's recommended heights.
3. Locate part-circle heads to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries, unless otherwise indicated.
4. Check for uniformity of coverage and pattern correctness. Adjust for 100% coverage where required.
5. Install nozzles with water running at reduced pressure starting with the head closest to the valve.
6. Adjust arcs and radius at normal operating pressure.

#### E. Electric Remote Control Valves

1. Adjust automatic control valves to provide flow rate at rated operating pressure required for each irrigation section.
2. Install valves in valve boxes, arranged for easy adjustment and removal. Locate valves to ensure ease of access for maintenance such that no physical interference with other elements of the project exist.

F. Remote Control Valve Tags - One Remote Control Valve Tag shall be attached to stem of each electric remote control valve. Tags shall be numbered sequentially. Numbers

shall correspond to station numbers in electric controller. Provide tags and corresponding numbers for wires pulled for future valves.

- G. Valve Boxes - Install valve boxes to cover electric remote control valves. Install two valves maximum in valve box where possible. Top of valve box shall be flush with finished grade. Bury minimum 4 bricks under base of each box as support.
- H. Control Wire Splice Boxes - Install control wire splice box to cover any splice in control wire. Top of valve box shall be flush with finished grade. Bury minimum 4 bricks under base of each box as support. Install control wire splice box to cover wires pulled for future valves.
- I. Gravel Backfill - Backfill valve boxes and control wire splice boxes with gravel, minimum 6 inch depth.
- J. Electric Controller
  - 1. Controllers shall be fully grounded.
  - 2. Connect remote control valves to controller in clockwise sequence to correspond with stations 1, 2, 3, successively.
  - 3. Affix a non-fading copy of irrigation diagram to cabinet door below controller's name. Irrigation diagram shall be sealed between two plastic sheets, 20 mils. minimum thickness. Irrigation diagram shall show clearly all valves operated by the controller, showing station number, valve size, and type of planting irrigated.
  - 4. Provide galvanized padlock against vandalism, one per Nema enclosure, Provide two keys to Owner. Keys to be matched with existing controller keylocking mechanisms.
  - 5. Controller to be pedestal mounted as per the drawings.
  - 6. Power to Controller & Locations: Locations shown on plan for controllers is approximate. Final location shall be determined on site by Owner. Contractor shall supply 120 VAC to controller from adjacent existing power sources. Follow local governing codes and City Codes in electrical work.

#### K. Irrigation Control Wires

- 1. Provide 24 volt system for control of automatic circuit-section valves of underground irrigation system. Provide unit capacity to suit number of circuits indicated.
- 2. Install control wires with irrigation mains and laterals in common trench where possible. Lay control wires neatly together to side of pipe. Provide looped slack at valves, comers, bores and snake wire in trench to allow for contraction. Tie wires in bundles at 10 foot intervals. Line splices will be allowed on runs of 500 Ft. or more. Splices shall be made and placed in control wire splice boxes.
- 3. Common ground wire shall be green. No other wires shall be green.
- 4. Supply one extra wire, for each direction of run, to valve which is located the greatest distance from the controller. Extra wire shall be white. Leave two loops of wire at each valve location.
- 5. Color of wire from controller to control valve shall be consistent to each valve.
- 6. Solder splices and protect with splicing material specified, Provide 12 inch long expansion loop within 3 feet of each wire connection and splice on runs of wire 100 feet or longer.

#### L. Backflow Preventers

- 1. Make required connection to water supply according to local codes and

manufacturer's written instructions.

2. Install pressure type backflow devices at required grade in accordance with the local plumbing code. Exposed mainline and mainline risers above PVC pipe main elevation shall be copper. Install one brass union in riser downstream of device.

### 3.04 TESTING

- A. General - Notify Consultant 48 hours in advance when testing will be conducted. Conduct tests in presence of Consultant.
- B. Hydrostatic Test - Test irrigation main line, before backfilling trenches, to a hydrostatic pressure of not less than 100 psi for 1 hour. Piping may be tested in sections to expedite work. Remove and repair or replace piping and connections which do not pass hydrostatic testing. System shall not lose more than 5% of the test pressure within a one hour period.
- C. Shut off mainline at backflow preventer during non working hours until Contractor has demonstrated the mainline is stable.
- D. Operational Testing - Perform operational testing after hydrostatic testing is completed, backfill is in place and irrigation heads are adjusted to final position.
  1. Demonstrate to Consultant that system meets coverage requirements, is a specified and indicated, and that automatic controls function properly.
  2. Coverage requirements are based on operation of one circuit at a time.
  3. After completion of grading, sodding and rolling of grass areas, carefully adjust lawn sprinkler heads so they will be flush with or not more than 1/2 inch above finished grade. Set shrub sprinkler heads not more than 1/2 inch above top of mulch.

### 3.05 MAINTENANCE

- A. Contractor shall correctly maintain the irrigation system during the installation process and throughout the landscaping maintenance service period.
- B. Contractor shall provide "As Built" Drawings for new work, showing dimensioned location of valves, meters, vacuum breakers, controllers, and mainline. Contractor shall request reproducible mylars from the Consultant in preparation of "As Built" Drawings.

END OF SECTION

**SECTION 02930  
PLANTING**

**PART I     GENERAL**

**1.01   RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and all applicable specification sections, apply to this section.

**1.02   DESCRIPTION OF WORK**

- A. This Section specifies the requirements for providing planting materials and their installation as indicated and scheduled. For grass installation, refer to Section 163 Seeding, Section 165 Sodding, Section 167 Hydromulching and Section 301 Site Preparation and Erosion Control.

**1.03   QUALITY ASSURANCE**

- A. Installer - Installation of planting work shall be performed by a single firm specializing in landscape and planting work. Contractor shall be licensed by the Texas Association of Nurserymen, shall possess an agricultural certificate, shall be a licensed pest applicator, and shall have not less than 5 years of experience in this type of work.

- B. Quality Control

- 1. Trees, Shrubs, and Groundcovers:

- a. Provide plants of quantity, size, genus, species and variety shown and scheduled for planting work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock." Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.
    - b. Label each plant with securely attached waterproof tag bearing legible designation of botanical and common name.

- 2. Compliance: Ship planting materials with Certificates of Inspection as required by governing authorities. Comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.

- 3. Substitutions: Do not make substitutions unless approved in writing by Consultant. If specified planting material is not obtainable, submit proof of non-availability to Consultant together with proposal for use of equivalent material. Contractor shall submit proposal in a timely manner as to not impact project completion or installation of other work.

- 4. Analysis and Standards: All packaged products shall be delivered in original manufacturer's sealed containers. For unpackaged materials, submit analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

- 5. Inspection: Notify Consultant at least 2 weeks prior to installation, of location where materials that have been selected for planting may be inspected, either at place of growth or the site prior to planting. Plant material will be inspected for compliance with requirements for genus, species, variety, size and quality. Consultant retains right to further inspect trees for size and conditions of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Contractor shall remove rejected trees immediately from site and replace with specified materials. Plant material not installed in accordance with Contract Documents will be rejected.

- C. Reference Standards Applicable to this section:

1. ANSI: American National Standards Institute
  - a. Z60.1: Nursery Stock
2. Association of Official Agriculture Chemists
3. FS: Federal Specifications and Standards
  - a. Q-P-166E: Peat, Moss; Peat, Humus; and Peat, Reed-Sedge
4. NBS: National Bureau of Standards
  - a. PS23: Perlite Product Standard

#### 1.04 SUBMITTALS

- A. Work Schedule: Contractor shall submit a work schedule for all planting work prior to purchase and installation of plant material.
- B. Certification:
  1. Submit, for Consultant's review and approval, manufacturer's or vendor's certified analysis of soil amendments. Submit other data substantiating that materials comply with specified and indicated requirements.
  2. Fertilizer certification shall be submitted for Consultant's review and approval as to the chemical analysis of the fertilizer, a listing of the elements contained therein and their percentages.
- C. Maintenance Instructions - Submit typewritten instructions, including manufacturer's recommendations and instructions recommending procedures to be established by Owner for maintenance of planting work. Submit instructions prior to expiration of Contractor's required maintenance period.
- D. Samples - Submit samples of topsoil, bark mulch and back fill mix.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials - Deliver packaged materials in fully labeled original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
- B. Plants
  1. Do not drop stock during delivery.
  2. Materials shall not be pruned prior to installation unless otherwise approved by Consultant in writing. Do not bend or bind-tie trees and shrubs in such a manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery.
  3. Deliver plants after preparation for planting has been completed and plant immediately. If planting is delayed more than 7 hours after delivery, set plants in shade, protect from weather and mechanical damage. Keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture, and water as needed.
  4. Do not remove container grown stock from containers before time of planting and water immediately after delivery and prior to planting.

#### 1.06 JOB CONDITIONS

- A. Work Scheduling - Proceed with and complete planting work in a timely manner, working within seasonal limitations for each kind of planting work required. Coordinate work and scheduling with tree mover.
- B. Planting Time
  1. Correlate planting with specified maintenance periods to provide maintenance from date of Substantial Completion.
  2. Plant frost-tender trees only after danger of frost is past or sufficiently before frost season to allow for establishment before first frost. Do not plant in frozen ground.
  3. Plant trees, shrubs and groundcover after final grades are established and prior to

planting of lawns and installing forest litter, unless otherwise directed by Consultant in writing. If planting occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

- C. Utilities - Refer to engineering drawings and coordinate with Utility Contractor for location of utilities. Contractor shall be responsible for damage to existing utilities and structures.
- D. Security - The Owner will not assume any responsibility for security of any materials, equipment, etc. during construction of the project until project acceptance.
- E. Excavation - Excavate as required on drawings for drainage installation and topsoil and planting soil placement. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions beyond the scope of this contract, or obstructions, notify Consultant of such conditions, immediately and before planting.
- F. Pollution Control - Control dust caused by planting operations. Dampen surfaces as necessary. Comply with pollution control regulations of governing authorities.

#### 1.07 SUBSTANTIAL COMPLETION AND FINAL ACCEPTANCE

- A. Substantial Completion notice for planting work will be issued by Consultant only for entire planting and landscape work.
- B. Substantial Completion notice will be issued only after Owner and Consultant inspect and approve all required planted materials and grassed areas.
- C. Final acceptance will be determined after the maintenance period and when all plant materials are alive and healthy and grass areas are established.
- D. Final acceptance notice will be issued only after Owner and Consultant inspect and approve all planting work as in accordance with the Contract Documents.

#### 1.08 SPECIAL PROJECT WARRANTY

- A. Contractor shall furnish written warranty of trees, shrubs, groundcover and turf for 12 months after date of final acceptance, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner or abuse or damage by others.
- B. Remove and replace trees, shrubs, and groundcover found to be dead or in unhealthy condition during warranty period. Replace shrubs and groundcover which are in doubtful condition at end of warranty period. However, if in the opinion of Owner, such doubtful material may survive, Contractor shall extend the warranty period for a full growing season. Owner will determine which items are in doubtful condition.
- C. Another inspection will be conducted by Owner, at end of extended warranty period to determine acceptance or rejection.

#### PART 2 PRODUCTS

- A. Fertilizer
  - 1. Granular fertilizer shall be a commercial fertilizer, uniform in composition, free flowing, and suitable for application with approved equipment. Fertilizer which has been exposed to high humidity and moisture, has become caked or otherwise damaged making it unsuitable for use, will not be acceptable. Application shall be Osmocote 13.13.13 + Iron by Sierra Chemical, 1-800-492-8255, 1001 Yosemite Dr., Milpitas, CA

95035, or approved equal. Broadcast and rototill fertilizer at the rate of 3 lbs. actual nitrogen per 1,000 square feet into prepared planting soil.

2. Agriform 20-10-5 Planting Tablets shall be evenly placed in planting pits at the following rate:

<u>Material</u>	<u>No. of Tablets</u>
1 gallon/4" pots	1 (or granular fertilizer)
5 gallon	3
15 gallon	7
Trees	1 Tablet for each 1/2" of tree trunk diameter

- B. Sharp Sand: Sand shall be thoroughly washed, coarse grade sharp, construction or brick sand, free of clay balls, weeds, and grass. So-called cushion sand, blow sand, or creek silt is not acceptable for substitution where sharp sand is specified,
- C. Herbicide
  1. Pre-emergent herbicide shall be Eptam 5G by Green Light Company, P.O. Box 471, Missouri City, Texas 77459, 713-438-6824, or approved equal.
  2. Contact herbicide shall be Roundup by Monsanto, 800 N. Lindbergh, St. Louis, Missouri, 63167, 314-694-1000, or approved equal.
- D. Mulch for top dressing: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs or plants. Mulch shall be well rotted, shredded hardwood bark mulch, brown in color by LETCO or approved equal.
- E. Root Stimulator: Shall be Hi-Yield Root Stimulator 5-12-3, by Voluntary Purchasing group, P.O. Box 460, Bonham, Texas, 75418, 214-583-5501, or approved equal. Spreader sticker as needed.
- F. Fire Ant Control: Durzban or 1% Diazanon Granular as manufactured by Green Light Projects Co., San Antonio, TX 78217 or Logic by PBI Gordon, Kansas City, MO.
- G. Insecticide: Lindane with Adjuvant distributed by Esco Distributors, 514 W. 25th Street, Houston, Texas 77008 713-864-7771.
- H. Planting Backfill Mix - Backfill mix for all planting EXCEPT the machine moved trees shall be native soil and professional bedding soil by LETCO (Living Earth Technologies) or approved equal at a 2:1 ratio by volume. Add fertilizer as per specifications.
- I. Steel Landscape Edging: Shall be COL-MET commercial type, seven (7) gauge steel landscape edging by Collier Metal Specialists Inc., 3333 Miller Park South, Garland, TX 75042. 800-829-8225, [www.colmet.com](http://www.colmet.com), or approved equal.
- J. Topsoil
  1. Provide topsoil which is fertile, friable, natural loam, surface soil, free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 2 inches in any dimension and other extraneous or toxic matter harmful to plant growth.
  2. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4 inches. Topsoil shall not be collected from sites that are infected with growth of, or the reproductive parts of noxious weeds, especially nut grass. Topsoil shall not be stripped, collected or deposited while wet. Topsoil shall not be excessively acid or alkaline or contain toxic substances which may be harmful to plant growth. Topsoil shall be without admixture of subsoil.

## 2.02 PLANT MATERIALS

- A. Trees - Provide trees of height and caliper scheduled or indicated on the drawings and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are scheduled or indicated. Branching height shall be as indicated on drawings.
- B. Shrubs and Groundcover - Provide specimen quality plant material as described in Construction Documents. Each individual species of plant material shall be obtained and provided from a single source.
- C. All plant material shall be approved by the Consultant prior to delivery to the project site.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Grading
  - 1. Perform fine grading within Contract limits, including adjacent transition areas, where required, to new elevations, levels, and contours indicated. Provide subgrade surfaces parallel to finished surface grades. Provide uniform levels and slopes.
  - 2. Grade surface to ensure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes. Provide subgrade surface free of exposed boulders or stones exceeding 4 inches in greatest dimension in paved areas; 2 inches lawn areas.
  - 3. Provide adequate drainage of the working area at all times.
  - 4. Fine grade soil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.
  - 5. Remove stones, roots, weeds, and debris while raking topsoil. Rake surface clean of stones 1 inch or larger in any dimension and of all debris.
  - 6. All finished grades shall meet line and grade of pavement. Finished grades (top of soil prior to hydromulch) shall be maximum of 1-1/2 inch below walkway pavement surface. Grade all slopes from rear of landscape easement or center of medians to walkways and curbs at a minimum of 2 percent slope.
- B. Plant Layout - Layout individual tree locations and shrub beds as shown on drawings for approval by the Consultant.
- C. Steel Landscape Edging - Refer to planting plans as to placement and style. Steel edging shall be laid according to drawings with smooth lines and transitions. No jagged or abrupt edges shall be left in place by the Contractor.
- D. Preparation of Planting Backfill Mix
  - 1. Mix specified soil amendments and fertilizers with topsoil at rates indicated. Delay mixing of fertilizer if planting will not follow placing of planting soil within 48 hours, unless otherwise directed. Amendments shall be incorporated into the soil as a part of the soil preparation process prior to fine grading, fertilizing, and planting. Each amendment material shall be broadcast or spread evenly at the specified rate over the planting area. Amendments shall be thoroughly incorporated into the soil until amendments are pulverized and have become a homogeneous layer of soil ready for planting. Incorporation and mixing shall be accomplished by mechanical means.
  - 2. For planting beds, mix planting soil prior to backfilling.
- E. Fire Ant Control - Fire ants shall be controlled with spot application of insecticide as necessary. Apply after dew has dried and when no rain is expected for 6 hours. Spot treat entire area of planting/grassing.

### 3.02 PLANTING

- A. Excavation for Trees and Large Shrubs:
1. Excavate pits with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage.
  2. Make excavations at least half again as wide as the ball diameter and equal to the ball depth, plus 3" allowance for setting of ball on a layer of compacted backfill.
  3. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.
- B. Planting Trees and Large Shrubs:
1. Set stock on layer of compacted planting soil mixture, plumb and in center of pit at same elevation as adjacent finished planting grades. Place fertilizer tablets evenly spaced in hole at specified rate. Place additional backfill mix around base and sides of ball and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Dish top of backfill to allow for mulching.
  2. Prune, thin out, and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
  3. Guy and stake trees immediately after planting as indicated on drawing.
  4. Top-dress planted areas with shredded hardwood mulch as provided by LETCO or approved equal.
- C. Excavation for Trees and Shrubs in Beds
1. Excavate entire planting beds to a depth of 8" for prepared soil / backfill mix and mulch. Till bottom of planter additional 4" and mix with prepared backfill mix. Planting bed to have vertical sides.
  2. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.
- D. Planting of Trees and Shrubs in Beds - Set stock on layer compacted planting soil mixture, plumb and at same elevation as adjacent finished planting grades. Place fertilizer tablets evenly spaced in planting bed at specified rate. Place additional backfill mix around base and sides of ball and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Dish top of backfill to allow for mulching.
- E. Treat entire areas of planting, shrub bed, grass and root balls with:
1. Broadcast application of fire ant insecticide at manufacturer's recommended rate.
  2. Broadcast application of pre-emergent herbicide at manufacturer's recommended rate (except seasonal beds).

### 3.04 MACHINE MOVED TREES

- A. Scope of Work:
1. Scope of Work includes pruning, digging, transporting and planting, sanding-in, chemical treatment, weed and grass control, mulching and miscellaneous for tree size and species as shown on drawings.
  2. Trees will be tagged in the field by the Contractor(s) and approved by Consultant as required.
  3. Trees will be moved with minimum 80" blade machine.
  4. Trees will be dug, transported and planted, pruned, sanded, mulched, root stimulated and sprayed for borers, and treated for weed and grass control by tree contractor(s). (See plan for details.)

5. Contractor will stake location of trees on site and obtain approval of Owner prior to moving trees.
  6. Contractor will be responsible for locating underground utilities.
  7. Contractor will be responsible for watering and maintaining the trees during the project until the project is complete and through the maintenance period.
- B. Pruning
1. Before digging, or within 48 hours after transplanting, Oaks will be Class IV pruned. Approximately 20% of the mass shall be removed.
  2. Crossing branches and branches that detract from the tree shall be removed first.
  3. The majority of the mass shall be removed from the outer canopy of the tree.
  4. All major interior branches shall be left intact, except those damaged during the pruning process.
  5. Approximately 80% of the smaller, interior branches (sucker growth) shall be left intact.
  6. All cuts should be back to a lateral and removed at the branch collar.
  7. All deadwood should be removed.
  8. Cuts greater than 2 inches shall be treated with approved tree wound dressing.
  9. "Anvil" type pruners or lopers will not be acceptable pruning equipment. Pruners should be kept sharp and adjusted properly to insure proper cuts.
- C. Digging, Transporting and Planting
1. Trees shall be centered in the machine when dug. Caution should be observed to minimize damage to the branches and trunks while backing onto or driving away from the tree.
  2. Roots protruding from the digging module shall be cut flush with root ball before planting.
  3. Trees are to be planted 2 to 3 inches higher than existing ground.
  4. Branches extending beyond the width or height of the trunk shall be tied down before transporting.
  5. A speed of 40 m.p.h. shall not be exceeded during transporting.
  6. Misters may be necessary during transport, pending weather conditions.
  7. Trucks shall back onto receiving hole in the same tracks that the hole was dug (exceptions may be outlined at discretion of Owner). Tree shall be set straight, in a true, vertical position. Root ball is to be placed intact.
  8. Driver shall shift through gears as smoothly as possible and drive prudently.
- D. Sanding-In
1. Trees shall be sanded-in with approved sharp sand.
  2. Sand should be washed into crevice with intent to minimize air pockets left between soil and tree ball.
  3. Water ring shall be prepared as shown on plans.
  4. Sanding-in shall be completed within 48 hours after planting.
- E. Chemical Treatment
1. Root Stimulating
    - a. Trees shall be root-stimulated with Hi-Yield, 5-12-3 and Hi-Yield Spreader Sticker mixed as per label or approved equal.
    - b. Mixture will be injected with approximately 150 p.s.i.
    - c. Apply mix at rate according to manufacturer's recommendations on each tree.
    - d. A second application shall be made approximately 90 days after project is complete.
  2. Trunk Sprayed
    - a. Trunks will be sprayed to run off with Lindane and Adjuvant mixed as per label

instructions.

- b. Should it rain within six hours after application, trees will be resprayed at Contractor's expense.
  3. Chemical treatment shall be completed within 48 hours after planting.
- F. Weed and Grass Control
1. The herbaceous vegetation should not be removed from the root ball area before mulching.
  2. An application of Round-Up or approved equal mixed as per label instructions shall be made only to poison ivy foliage.
- G. Maintenance and Replacement
1. Contractor shall be responsible for all warranty and replacement of trees for a period of one year from the date of Final Acceptance.

### 3.05 CLEANUP AND PROTECTION

- A. During planting work, keep pavements clean and work area in an orderly condition. Sweep site and remove trash at end of each work day as necessary.
- B. Protect planting work and materials from damage due to planting operations, operations by other contractors and trades and trespassers. Maintain protection during installation periods. Treat, repair or replace damaged planting work as directed by Consultant.
- C. Stockpile, haul from site, and legally dispose of waste materials and debris. Accumulation will not be permitted. Maintain haul and disposal routes clear, clean, and free of debris. On-site burning of combustible cleared materials will not be permitted.
1. Upon completion of work, clean areas within Contract limits, remove tools, supplies and equipment. Wash down curbs and pavement areas. Scrub curbs and walks as necessary to insure a clean surface. Provide site clean and free of materials and suitable for use as intended.

### 3.06 MAINTENANCE

- A. Contractor shall correctly maintain the planting work throughout the installation process and the maintenance period. If not specified elsewhere, the maintenance period shall run through the date of the final acceptance of the project as defined in Section 01705-Project Closeout.

### 3.07 INSPECTION AND ACCEPTANCE

- A. When planting work is completed and at the completion of maintenance period, Owner will make an inspection to determine acceptability.
- B. When inspected planting work does not comply with the Contract Document requirements, replace rejected work and continue specified maintenance until reinspected by Owner and found to be acceptable. Contractor shall remove rejected plants and materials promptly from site.

**SECTION 2970**  
**EXTERIOR LANDSCAPE MAINTENANCE**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and all applicable specification sections, apply to this section.

**1.02 WORK COVERED**

- A. Furnish all labor, materials and equipment as necessary to provide a landscape maintenance program in strict accordance with the Specifications and Drawings as prepared by MHS Planning & Design.

**1.03 RELATED WORK IN OTHER SECTIONS**

- A. Examine all section for work related to this section.

**1.04 SCOPE**

- A. Work Included:
1. Mowing, edging, weeding and trimming of lawn areas.
  2. Pruning and trimming of trees and shrubs.
  3. Weeding of mulched areas
  4. Application of fertilizers, insecticides, and herbicides
  5. General site clean-up, removal of trash and products of maintenance.

**1.05 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Perform work in accordance with all applicable laws codes, and regulations required by authorities having jurisdiction over such work and provide for all permits required by local authorities.

**1.06 CONTRACTOR RESPONSIBILITIES**

- A. The Contractor shall begin maintenance immediately upon starting any , portion of' the Work of this contract.
- B. Contractor's Maintenance Period shall end upon final completion and City Council acceptance of all Work in this contract.
- C. Trees, Shrubs and Groundcovers: The Contractor's maintenance of new planting shall consist of' watering, cultivating, weeding, mulching, re-staking, tightening and repairing of guys, resetting plants to proper grades or upright position, restoration of the planting saucer, and furnishing and applying such sprays and invigorants as are necessary to keep the plantings free of insects and disease and in thriving condition.
- D. Lawns: The Contractor's maintenance of new lawns shall consist of mowing, watering, weeding, repair of all erosion and reseeding as necessary to establish a uniform stand of the specified grasses.

**1.07 PROTECTION**

- A. Protect planting areas and lawns at all times against damage of all kinds for duration of maintenance period. Maintenance includes temporary protection fences, barriers and signs as required for protection. If any plants become damaged or injured, because sufficient protection was not provided, treat or replace as directed by Owner at no additional cost to Owner.

1.08 FINAL ACCEPTANCE

- A. Work under this section will be accepted by Landscape Architect upon satisfactory completion of all work, including maintenance, replacement of plant materials and lawns under the warranty period. Upon final acceptance, the Owner will assume responsibility for maintenance of the work.

1.09 WARRANTIES AND REPLACEMENTS

- A. Refer to other sections.

1.10 MAINTENANCE INSTRUCTIONS

- A. At the completion of work, furnish two (2) copies of written maintenance instructions to Owner and one (1) copy to Landscape Architect for maintenance and care of the seeded areas and all planting throughout the year.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials required for installed items shall match those already in use.
- B. Samples of all materials not specified under other sections of these specifications shall be submitted for review by the Landscape Architect prior to use.
- C. Topdress Fertilizer: Commercial fertilizer with guaranteed analysis of 16-6-8 or as required for application use.

2.02 REQUIRED EQUIPMENT

- A. Contractor shall furnish the following maintenance equipment:
  - 1. Riding Lawnmowers
  - 2. Push Lawnmowers
  - 3. Gasoline Powered Edgers
  - 4. Trash Collection Equipment
  - 5. Line Trimmers
  - 6. Misc. Hand Tools, Rakes, Brooms, etc.
  - 7. Blowers
  - 8. Other as needed.

PART 3 EXECUTION

3.01 WATERING

- A. It shall be the responsibility of the Contractor to assure that the correct watering of plant materials is being accomplished through the following irrigation techniques:
- B. Regular deep watering to all new trees until there are definite signs that the trees have established themselves, new growth is apparent, and no trees are experiencing stress conditions.
- C. Frequent watering to the lawn areas to insure against drying. This may be accomplished as above, by the automatic sprinkler system, hand watering or portable sprinklers. Contractor shall monitor settings of automatic sprinkler controls and recommend necessary adjustments according to climatic changes.
- D. Contractor shall be responsible for damages to irrigation system caused by mowing and other maintenance operations.

3.02 MAINTENANCE OF TURF AREAS

- A. Mowing lawn/grass areas shall be accomplished with sharp, properly adjusted mowers of the correct size for the various areas.
- B. Mowing frequency shall be as per the Landscape Maintenance Program. Blade heights

shall be set according to the following schedule.

- |    |              |                  |
|----|--------------|------------------|
| 1. | 2 inches     | Initial Mowing   |
| 2. | 2 1/2 inches | April - November |
| 3. | 2 1/2 inches | December - March |

- C. In the event of a prolonged rainy period and a surge of leaf growth is anticipated, the mower height may be readjusted to prevent "scalping" or skinning of lawn on preceding cuts.
- D. Lawn shall be edged evenly at all walks, headers and other structures as per Landscape Maintenance Program.
- E. Until the establishment of the turf, the Contractor will be responsible for replacing soils that have eroded onto the paved areas. Residual soils on paving will be removed and if not mingled with objectionable materials may be re-used in eroded areas.
- F. Immediately upon observing any lawn grass spreading into shrub or groundcover areas, the Contractor shall initiate a program of removal and maintain this program throughout the maintenance period.
- G. Any lawn grass appearing in paved areas shall receive an application of soil sterilant according to manufacturer's direction. The sterilant shall be approved and will not be detrimental structurally to paved areas.
- H. Special effort shall be given to the control of fire ants infesting the site. After control is accomplished, the ant mounds shall be lowered and tamped to the existing grade.
- I. Apply topdress fertilizer (10-6-8) thirty (30) days after seeding.
- J. Removal of debris from the site unrelated to horticultural maintenance (paper, bottles, can, "Pirate" signs, etc.) shall be the responsibility of the Contractor. Frequency as per Landscape Maintenance Program.

### 3.03 MAINTENANCE OF TREES AND SHRUBS

- A. Contractor shall adjust and tighten as required all tree staking and guying. Removal as directed by Owner's Representative.
- B. Contractor shall deep water all new trees until there are definite signs the trees have established themselves and are pushing out new growth.
- C. Watering basins shall be removed by Contractor after the trees have established themselves or as directed by Owner's representative. Basins are normally removed one year from time of planting.
- D. Contractor shall be continuously alert for signs of insect presence or damage or the presence or damage from plant fungi. Upon locating such evidence, the Contractor shall report it to the Owner's Representative and take action as directed.

## PART 4 SCHEDULES

### 4.01 MOWING, EDGING, TRIMMING, LITTER CLEAN UP, WATERING AND IRRIGATION

MONITORING:

<u>MONTH</u>	<u># OF VISITS PER MONTH</u>
January	2
February	2
March	4
April	4
May	5
June	4
July	5
August	5
September	5
October	3
November	2
December	2

4.02 TOPDRESS FERTILIZER

A. Thirty (30) days after seeding.

4.03 MULCHING, WEEDING, WEED CONTROL, GUYING AND STAKING ADJUSTMENT

A. As required at each visit.

4.04 RESEEDING

A. As required upon notice.

END OF SECTION

**SECTION 3010  
CONCRETE FOR STRUCTURES**

1. DESCRIPTION: This section shall govern the furnishing of all labor, materials, tools, plant performing all operations required to install all concrete and reinforcing steel, and completely finishing the concrete items in strict accordance with the requirements of these specifications and the applicable drawings and subject to all conditions of the contract including, but not limited to the following:

Drilled shafts and Under-reamed foundations  
Slabs on grade  
Walls  
Grade Beams  
Exterior Steps and Landings  
Retaining Walls  
Paving  
Basement Columns  
Sidewalks  
Reinforcing Walls  
Structures  
Curb and Gutter

2. MATERIALS:

- A. Reinforcing Steel: Reinforcement shall conform to the requirements of Section 3210 of these specifications.

- B. Cement: The cement shall be either Type I or Type III of a standard brand of Portland Cement which shall conform to ASTM Specification C-150. The Contractor, if he so elects in order to facilitate his own operations, may use Type III cement.

All cement shall be protected against dampness, and no cement will be accepted which has become caked.

- C. Water: Water for use in concrete mixtures shall conform to the provisions of AASHTO Test Method T-26 for quality of water.

- D. Coarse Aggregate: The coarse aggregate shall consist of gravel, crushed stone, blast furnace slag or combinations thereof with a wear of not more than forty (40) percent when tested according to AASHTO Method T-96. Aggregate shall conform to the requirements of ASTM C-33.

The maximum size of coarse aggregate shall not be larger than one-fifth (1/5) of the narrowest dimension between forms of the member for which concrete is to be used nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars.

- E. Fine Aggregate: The fine aggregate shall consist of sand conforming to ASTM designation C-33. The sand shall not contain more than 1½% clay and shall not show darker than very light amber when tested by the colorimetric method.

The fine aggregate shall conform to the following grade requirements:

Retained on 3/8" screen.....0% by weight  
Retained on 1/4" screen.....0% to 5% by weight  
Retained on No. 20 sieve.....15% to 50% by weight  
Retained on No. 100 sieve.....85% to 100% by weight

F. Admixtures:

a. ADMIXTURES FOR CONCRETE

<p>GENERIC PRODUCT: High Range Water Reducer (Super plasticizers) ASTM C-494 Type F/G</p>	<p>APPROVED PRODUCTS: Master builders Rheobuild: 716-Temp. - 80 deg F 1000-Temp. - 80 deg F</p>	<p>REQUIRED USAGE: ALL structural walls or other work requiring two sided forming and tightly confined concreting; concrete columns above grade; Concrete drops &gt; 5'-0'</p>
<p>Air Entrainer ASTM C-260</p>	<p>Master Builders Micro Air</p>	<p>All concrete</p>
<p>Accelerator ASTM C-494 Type C</p>	<p>Pozzolith 555-Accelerator Pozzolith 122-HE (chloride) Pozzolith 20 (low temp)</p>	<p>Concrete placed on perm. steel floor and deck systems; bridge deck repair; concrete pavement patching; tilt walls</p>
<p>Retarder ASTM C-494 Types B/D</p>	<p>Pozzolith 100-XR</p>	<p>For delayed set; with approval of Engineer only</p>

b. All concrete shall have air entrainment based on the maximum size coarse aggregate:

Maximum Size Aggregate	Total Air Percent
1½"	4.5%+/-1%
¾"	

c. Install admixtures per manufacturer's instructions.

3. CONCRETE QUALITY: The concrete shall be composed of Portland Cement fine aggregate, coarse aggregate, and water, all as specified herein.

The concrete shall be homogenous, readily placeable and uniformly workable. Unless noted otherwise on the plans, the minimum cement content, maximum allowable water content, and minimum compressive strength of the various classes shall conform to the following:

<u>Class of Concrete</u>	<u>Min. Cement Content Sacks/ Cy/Yd</u>	<u>Max Water Content Gal/Sack of Cement</u>	<u>Minimum Compressive Strength psi @ 7 days</u>	<u>Minimum Compressive Strength psi @ 28 days</u>	<u>Minimum Beam Strength psi @ 7 days</u>
A	5.0	6.5	2,000	4,000	500
B	4.5	7.0	1,700	2,500	330
C	4.0	8.0	1,300	2,000	600
S	6.0	5.0	2,500	3,600	600

The dry loose volume of coarse aggregate shall not exceed 0.82 cubic foot per cubic foot of finished concrete except in cases where the voids in the coarse aggregate as determined by standard test methods exceed 48 percent of the total dry loose volume. Where the voids

exceed 48 percent of the total dry loose volume, the dry loose volume of coarse aggregate shall not exceed 0.85 cubic foot of finished concrete.

The net amount of water shall be the amount added at the mixer, plus the free water in the aggregate, and minus the absorption of the aggregate based on a thirty-minute absorption period. No allowance will be made for evaporation of water after batching.

- A. Class Requirements: The following are maximum slumps and the class of concrete required for various types of construction. (Slump test prior to addition of plasticizers.)

<u>Type of Construction</u>	<u>Slump Inches Maximum</u>	<u>Class of Concrete</u>
Drilled Shafts & Underreamed Foundations	5	A
Slabs on Grade	4	A
Walls and Columns	3	A
Grade Beams	4	A
Structural Slabs & Beams	4	A
Driveways and Walks	4	A
Retaining Walls	4	A
Curb and Gutter	3	A

- B. Characteristics of Mix: Concrete shall be of such consistency as to insure the required workability and result in compact masses having dense, uniform surfaces. In cases where the characteristics of the aggregates are such that the maximum allowable amount of water, the consistency requirements cannot be satisfied, additional aggregates, mineral filler or aggregates of a different character may be furnished to produce the desired results. If these materials are not provided, then the mix design will be modified to insure proper workability for adding additional cement. Concrete temperature shall not be less than 50 degrees F nor more than 90 degrees F.

In general, the consistency of the concrete mixtures shall be such that:

- a. The mortar will cling to the coarse aggregate.
- b. The aggregates will not segregate in the concrete when it is transported to the place of the deposit.
- c. The concrete and mortar will show no free water when removed from the mixer.
- d. The surface of the finished concrete will be free from a surface film of "laitance".

Any concrete mix failing to meet the above outlined consistency requirement, although meeting the slump requirements, will be considered unsatisfactory, and the mix shall be changed to correct such unsatisfactory conditions. In cases where the characteristics of the aggregates furnished are such that, with the maximum allowable amount of water, the specified slumps and consistency requirements are not met, aggregates of an improved grading must be furnished and the mix design must be modified to meet the slump and consistency requirements by adding either cement or mineral filler, or both, as may be necessary. In case mineral filler is used, the combined total quantity of mineral

filler and fine aggregate passing the 100 mesh sieve shall not exceed twenty (20) percent of the weight of the fine aggregate.

It is the intent of these specifications to secure for every part of the work, and particularly so where the concrete is to be liquid containing, concrete of homogeneous structure having the required strength and resistance to weathering, which is free of honeycomb, concealed voids or other defects, and which for the various structures and appurtenances shall develop the minimum compressive strengths as indicted in these specifications.

The minimum quantity of cement and mixing water should be used that will safely produce concrete of the strength required, in order to minimize heat of hydration and shrinkage in the concrete.

4. MIXING CONDITIONS: The concrete shall be mixed in quantities required for immediate use, and any concrete which is not in place within thirty (30) minutes after being discharged from the mixer shall not be used. Re-tempering of concrete will not be permitted. Concrete improperly mixed shall not be placed in the structure. Ready-mixed concrete will comply with the following requirements:

- A. Central mixed concrete shall be mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitator or in a truck mixer operating at agitator speed.
- B. Shrink-mixed concrete shall be partially mixed in a stationary mixer, and the mixing completed in a truck mixer.
- C. Transit-mixed concrete shall be completely mixed in a truck mixer.

Mixers and agitators shall be operated within the limits of capacity and speed of rotation as designated by the manufacturers.

When a stationary mixer is used for partial mixing of the concrete, the mixing time in the stationary mixer may be reduced to the minimum required to intermingle the ingredients (about 30 seconds).

When a truck mixer is used for complete mixing or to finish partial mixing in a stationary mixer, each batch of concrete shall be mixed not less than 50 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment as mixing speed. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed.

Delivery of concrete to the site of the work and its discharge from the truck mixer, agitator or non-agitating equipment shall be completed within ½ hour after the introduction of the mixing water to the cement and aggregates, unless otherwise authorized by the Engineer.

All transit mix delivery tickets shall have the time of departure from the plant as well as water, cement, aggregates and admixture contents.

Hand mixing of concrete will be permitted, it shall be done on a watertight platform. The fine aggregate and cement shall first be mixed until a uniform color is attained, and then spread over the mixing board in a thin layer. The coarse aggregate shall be thoroughly saturated with water, and it shall then be spread over the fine aggregate and cement in a uniform layer, and the whole mass turned as the additional water is added. After all ingredients have been

added, the mass shall be turned at least six times, or more if necessary, to make the mixture uniform in color and smooth in appearance. Hand mixed batches shall not exceed a two (2) bag batch volume.

5. **FORMWORK:** The Contractor shall provide forms that will produce correctly aligned concrete. The centering shall be true and rigid, and thoroughly braced both horizontally and diagonally. The forms shall be sufficiently strong to carry the dead weight of the concrete as a liquid without deflection, and tight enough to prevent leakage of mortar.

For exposed interior and exterior concrete surfaces of columns and walls, plywood or other approved forms, thoroughly cleaned and tied together with approved corrosion resistant devices shall be used.

Rigid care shall be exercised in seeing that all poured walls and columns are plumb and true and thoroughly cross-braced to keep them so.

Beveled strips shall be provided in a form angles and in corners of column and beam boxes for chamfering of corners where shown on drawings or directed by the Engineer.

The inside of the forms shall be coated with an approved oil or thoroughly wetted. Oil shall be applied before reinforcement is placed.

Temporary openings for cleaning and inspection shall be provided at the base of vertical forms and other places where they are necessary.

Forms may be removed at the following minimum times.

	*Over 95F.	70-95F.	60-70F.	50-60F.	Below 50
Walls	5 days	1 day	2 days	3 days	Do not remove forms until site cured test cylinder develops 50% of 28 day strength
Columns	7 days	2 days	3 days	4 days	
Beam	10 days	4 days	5 days	6 days	
Structural Slabs 5" thick or less	10 days	5 days	6 days	7 days	
Structural Slabs Over 5" thick	12 days	6 days	8 days	9 days	
Curb & Gutter	1 day	1 day	1 day	1 day	

\*Where exposed surfaces of concrete can be effectively sealed to prevent loss of water, these times may be reduced to the 70-95 degrees F. time.

6. **PLACING OF REINFORCEMENT:**

A. Metal reinforcement, at the time concrete is placed, shall be free from rust, scale, or other coating that will destroy or reduce the bond. All bars shall be bent cold. Straightening or rebending shall not be allowed which will injure reinforcement. Bars with kinks or bends not shown on the plans shall not be used.

B. Metal reinforcement shall be accurately placed and adequately secured in position by

concrete or metal chairs and spacers. In no case shall the clear distance between bars be less than 1", nor less than 1-1/3 times the maximum size of the coarse aggregate. All metal chairs, wire and spacers shall be galvanized.

- C. Splices shall have a length of not less than thirty (30) times the normal size of diameter of the reinforcement, except in the cases of welded splices, and shall be well distributed or else located at points of low tensile stress. No splices other than welded splices will be permitted at points where the section is not sufficient to provide a minimum distance of two inches between the splice and the nearest adjacent bar or the surface of the concrete. The bars shall be rigidly clamped or wired at all splices in a manner approved by the Engineer.
- D. The reinforcement of footings and other principal structural members in which the concrete is deposited against the ground shall have not less than 3" of concrete between the steel and the ground contact surface.

If concrete surfaces, after removal of the forms, are to be exposed to the weather or be in contact with the ground, the reinforcement shall be protected with not less than 2" of concrete over bars more than 5/8" in diameter and 1½" over bars 5/8" or less in diameter.

Concrete protection for reinforcement shall in all cases be at least 1½".

- E. Bend bars around corners in structural walls and footings. Do not splice bars at right angles in corners but rather lap splice 4 feet or more from corners if dimensions permit.
- F. No concrete shall be deposited until the Engineer has inspected the placing of the reinforcement and given permission to place concrete.

## 7. DEPOSITING CONCRETE:

- A. Before placing concrete, thoroughly clean the forms of wood chips, shavings or other debris. Do not deposit concrete in standing water.
- B. Before placing new concrete on or against concrete which has acquired its initial set, retighten forms, roughen hardened surfaces, clean off foreign matter and laitance, and saturate with water. Immediately before depositing new concrete, coat the contact surface with neat cement grout.
- C. Concrete shall be deposited, when practicable, in its final position without segregation, rehandling, or flowing. When possible, concreting shall be continuous until the section is complete.
- D. Concrete shall be spaded and vibrated with approved mechanical vibrator to maximum subsidence, without segregation, and adjacent to forms and joints.
- E. Slabs and beam stems shall be placed in one operation.
- F. Concrete columns and walls shall have been poured at least 2 hours before the floor system supported thereon is poured.
- G. When stoppage of concreting operations occurs for any reason, construction joints shall be placed either horizontally or vertically as needed, provided with keys to resist shear, and dowels to develop bond. Before concreting operations are resumed, the surface of the concrete shall be cut or chipped to remove all laitance and expose the aggregate.
- H. Water accumulating during placing should be removed. Concrete shall not be deposited in

such accumulations.

- I. Conveying and chuting of concrete shall be done only with equipment which will insure a continuous flow without segregation. Concrete without super plasticizers admixtures shall not be dropped more than five feet without a tremie or "elephant trunk". Super plasticized concrete may be dropped (free fall) from a height of 15 feet or less.
- J. Construction joints in foundation walls, interior and exterior, shall be V chamfered unless otherwise shown. Location of joints shall be shown on the drawings or as approved by the Engineer.
- K. In threatening weather, which may result in conditions that will adversely affect the quality of the concrete to be placed, the Engineer may order postponement of the work. Where work has been started and changes in weather conditions require protective measures to be used, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall or damage due to freezing temperatures.
- L. No concrete shall be placed without the approval of the Engineer when air temperature is at or below 40 degrees F. (taken in the shade away from artificial heat) and falling. If authorized by the Engineer, concrete may be placed when the air temperature is at 35 degrees F. and rising.

8. EXPANSION JOINTS: Expansion joints shall be of the type and size shown on the plans.

9. FLOOR HARDENER: All interior or exterior floors and loading docks having an exposed concrete surface shall be hardened with floor hardener as approved by the Engineer.

10. MONOLITHIC FLOOR FINISH: All slabs shall be given a monolithic finish, first tamping with a grill tamp to force coarse aggregate slightly away from the surface; then floated to the required finish level. The surface shall be troweled twice in order to produce a smooth, impervious surface.

Abrasive non-slip floors where shown on the drawings shall be, or shall be equal to, Sonneborn Frictex H applied in strict accordance with the manufacturer's directions.

11. FINISHES: Finish all surfaces on inside of structures and to a distance of 1'-0" below finished ground on exterior of walls.

Sidewalks and driveways will receive a medium broom finish after leveling with a wooden float. Radius all exposed edges of slabs on grade.

12. CURING CONCRETE: Driveways, curbs and gutters, floors and vertical surfaces shall be sprayed with a curing compound meeting the requirements of Section 03012 to retard evaporation of water if spraying is not objectionable because of subsequent finish. Curing operations shall begin as soon as the concrete has attained initial set. All materials and facilities for curing concrete shall be on hand and ready for use before concrete is placed. Concrete shall be protected from freezing temperatures for a minimum of five (5) days after placement. Refer to Section 03012 "Membrane Curing".

13. WATER PROOFING: All concrete walls and floors in contact with process or ground waters shall be treated with chemical coating equal to "Procrete" which reacts chemically with concrete to form a crystalline vapor barrier. Unless noted, treatment is required only on the interior concrete surface. Apply per manufacturer's written instructions. Polyethylene vapor barrier, if shown on the plans, shall be 6 mil thickness, fungi resistant sheets fastened with adhesive backed polyethylene tape.

14. TEST ON CONCRETE: One set of three test cylinders shall be made by the Contractor for compressive strength tests performed by an approved independent testing laboratory (all at the expense of the Owner) for each thirty (30) cubic yard lot or a minimum of one set for each days pour. Slump test shall be made on each batch tested in accordance with ASTM designation C-143. Each of the test cylinders shall be tested at 7 days and 28 days for compressive strength. The Contractor shall coordinate tests with the Owner's designated laboratory.

If the average strength of the laboratory control cylinders for any portion of the structure falls below compressive strength required for the design, the Engineer shall order further standard ASTM test procedures to be performed at the Contractor's expense upon concrete sections in question. Should these further tests indicate that any concrete does not meet the requirements of these specifications, the concrete shall be removed and replaced with acceptable concrete by the Contractor and at Contractor's expense.

Copies of reports of all tests shall be furnished to the Engineer and Contractor as soon as available.

Tests on concrete shall conform to the following applicable ASTM designations:

ASTM C-173 or C-231 - Air Content of Freshly Mixed Concrete.

ASTM C-172 - Standard Method of Sampling Fresh Concrete.

ASTM C-143 - Standard Method of Slump Test.

ASTM C-39 - Standard Method of Test for Compressive Strength of Molded Concrete Cylinders.

ASTM C-31 - Standard Method of Making and Curing Concrete Compression and Flexure Text Specimen in the Field.

15. MEASUREMENT: The concrete quantities of the various classifications which constitute the completed and accepted structure will not be measured unless otherwise noted in the proposal, but will be considered as a part of the lump sum payment for the item constructed. If noted on the plans or in the Special Provisions measurement will be by the cubic yard in place.
16. PAYMENT: The concrete quantities if measured by the square or cubic yard will be paid for at the unit prices bid per square or cubic yard for the various classifications of concrete shown, which prices shall be full compensation for furnishing, hauling and mixing all concrete materials, placing, curing and finishing all concrete; all grouting and pointing; furnishing and placing all drains, expansion joints, metal flashing strips, reinforcing steel; and for all forms and falsework, labor, tools, equipment, and incidentals necessary to complete the work.

Otherwise all concrete shall be considered as a part of the lump sum price bid for the various items of construction. The lump sum price shall include full compensation for furnishing, hauling, and mixing all concrete materials, placing, curing, and finishing all concrete; all grouting and pointing; furnishing and placing all drains, forms, and falsework, labor, tools, equipment, and incidentals necessary to complete the work.

END OF SECTION 3010

## SECTION 03210

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

- 1.01 SCOPE: The extent of concrete reinforcement is shown on the drawings and in schedules. The work includes fabrication and placement of reinforcement for the cast-in-place concrete, including bars, ties and supports.
- 1.02 RELATED WORK SPECIFIED ELSEWHERE:
- A. Section 03100 - Concrete Formwork.
  - B. Section 03300 - Cast-in-Place Concrete.
- 1.03 CODES AND STANDARDS: Comply with requirements of the following codes and standards, except as herein modified:
- A. American Concrete Institute, ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
  - B. American Welding Society, AWS, D 12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connection in Reinforced Concrete Construction.
  - C. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
- 1.04 SUBMITTALS: Submit to the Architect in conformance with the requirements of the CONDITIONS OF THE CONTRACT.
- A. For information only, submit two (2) copies of steel producer's certificates of mill tests for reinforcing steel.
  - B. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement.
  - C. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrication and placement of concrete reinforcement.
- 1.05 PRODUCT, DELIVERY, HANDLING, AND STORAGE:
- A. Deliver reinforcement to the project site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
  - B. Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or excessive rust.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS:**

- A. Reinforcing Bars: ASTM A615 of grade shown on drawings with minimum yield strength of 60,000 psi.
- B. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place.
  - 1. Use wire bar type supports or plastic-type chairs, complying with P57-66, unless otherwise indicated.
  - 2. Do not use wood, brick, and other unacceptable materials.
  - 3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic or plastic-tipped metal.
  - 4. Slip dowels to be 12" length minimum. Specific product with materials and methods to be approved.

### **2.02 FABRICATION:**

- A. General: Shop-fabricate reinforcing bars to conform to required shapes and dimensions with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the work:
  - 1. Bar lengths, depths and bends exceeding specified tolerances.
  - 2. Bends or kinks not indicated on drawings or final shop drawings.
  - 3. Bars with reduced cross section due to excessive rusting or other cause.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION:** Comply with the specified codes and standards and the Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as herein specified.

- A. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- B. Position, support, and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by chairs, as required.
- C. Place reinforcement to obtain the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports together with No. 16 gauge wire to hold

reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.

- D. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than two (2") inches beyond the last leg of any continuous bar support. Do not use supports as bases for concrete conveying equipment and similar construction loads.
- E. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of ACI 318 for minimum lap of spliced bars.

END OF SECTION

## Section 4200 Masonry

### **Part I - General**

- 1.01 Scope:  
Furnish all labor and materials necessary for a complete installation of all masonry as shown on the drawings or as otherwise required.
- 1.02 Reference Standards:  
Comply with all applicable requirements of the Structural Clay Products Institute, American Standards Association and the Texas Concrete Masonry Association Standards.
- 1.03 Storage of Materials:  
Store mortar materials on dunnage in dry place. During freezing weather, protect masonry units with tarpaulin or other suitable material. Protect reinforcement and accessories from elements.
- 1.04 Coordination:  
Openings and chases for heating and plumbing and electrical ducts, pipes and conduits shall be built into masonry as required. Provide for installation of bolts, toggles, flashings, beams, anchors, hangers, nailing strips, wall plugs, and frames as required. Consult other trades in advance and make provisions for installation of their work to avoid cutting and patching.
- 1.05 Foreman:  
Only skilled workmen shall be employed. A thoroughly competent foreman shall be kept in charge of the work at all times.
- 1.06 Scaffolding:  
Furnish, erect, maintain, move and finally remove all scaffolding and staging required for, or in connection with, the installation of masonry work. Scaffolding shall be constructed and maintained in compliance with all applicable ordinances, laws, and rules.
- 1.07 Field Construction Mock-Ups:  
Prior to installation of masonry, erect sample wall representative of completed masonry work required for the project with respect to qualities of appearance, materials, and construction.

### **Part II - Products**

- 2.01 Materials:
- A. Masonry Units:
1. Shall comply with the latest revised ASTM Specifications.
  2. Shall be furnished in accordance with Part IV of these specifications.
- B. Mortar:
1. Portland Cement: ASTM C-150, Type I, only one brand of cement shall be used throughout the work. Color - To Be Selected By Owner.
  2. Hydrated Lime: ASTM C207, Type S.
  3. Aggregate for Mortar: ASTM C-144 washed and well graded in size, free from organic matter. All material shall pass an eight (8) mesh screen.
  4. Water: Clean and potable, free from organic matter.
- C. Reinforcement:
1. Horizontal Joint Reinforcing and Ties for Masonry: Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner ("L") and

intersecting ("T") units. Fabricate from cold drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross rods, into units with widths of approximately 2" less than nominal width of walls and partitions as required to position side rods for full embedment in mortar with mortar coverage of not less than 5/8" on joint faces exposed to exterior and not less than 1/2" elsewhere. Provide the following type of joint reinforcing unless otherwise indicated.

(a) Truss type with diagonal cross rods spaced not more than 16" o.c.

2. Wire Size and Finish: Fabricate with 9 gauge side and cross rods of manufacturers standard hot-dip galvanized finish complying with ASTM A 153, class B-2 coating.
3. Masonry Reinforcing: AA Wire Products AA610 (3) wire BLOK-TRUS, or approved equal. Width as required for masonry wall.
4. Anchors & Ties: Provide straps, bars, bolts, and rods fabricated from less than 16 gauge sheet metal or 3/8" diameter rod stock, unless otherwise indicated.
5. Veneer Ties: AA Wire Products, AA311, or approved equal. 20 gauge galvanized, corrugated wall ties.

D. Miscellaneous Masonry Accessories:

1. Reinforcing bars: Refer to "Concrete and Reinforcing Steel" of this specification.
2. Vertical bar positioners: 9 gauge rods, standard - manufactured by Dur-O-Wall or equal.

E. Mortar Admixture: "Omicron" as manufactured by Master Builders Company.

F. Control Joints: AA Wire Products or approved equal, AA 20004 BLOK-TITE control joints.

G. Cleaner: "Deox" chemical cleaner as manufactured by National Chemsearch Corp. or "Sure Klean" as made by Process Solvent Company, Inc.

2.02 Mixes:

A. Mortar Proportions:

1. Mortar shall be type S mortar as per ASTM C270 proportion specifications. Mix shall be proportioned as follows:
  - 1 Part Portland Cement
  - 2 Parts Masonry Cement
  - 6 Parts Sand
2. Samples may be taken to assure mortar meets minimum strength requirements.

B. Mixing Mortar:

Mix cementitious material and aggregate for a minimum of five (5) minutes in a mechanical batch mixer. Add water in amounts compatible with convenience in using mortar. If mortar begins to stiffen from evaporation or absorption of a part of the mixing water, retemper by adding water and remix. Use mortar within two (2) hours of initial mixing; do not use mortar after it has begun to set.

**Part III - Execution**

3.01 Workmanship:

- A. Lay all masonry work plumb, courses level, true to dimensions, square in bond and properly anchored.
- B. No exposed broken, chipped or cracked units will be allowed.

- C. Maintain three-eighth (3/8") inch clearance between all masonry and structural steel.
- D. Provide weep holes approximately twenty-four (24") inches apart to the vertical joint of the first course above grade in the exterior wythe of the exterior cavity wall for cavity drainage.
- E. Leave cavity clean of all mortar drippings.
- F. Provide a minimum of eight (8") inches solid masonry at all door and window jambs and at end of exterior masonry walls.
- G. Where cutting exposed masonry is required, power driven carbonrondum type masonry saw will be used.
- H. No brick joints shall exceed one-half (1/2") inch and shall be uniform, tooled with round rod or as directed by the Architect.
- I. All masonry units laid with full mortar beds and with completely full vertical head joints.

### 3.02 Joint Reinforcement:

Provide continuous welded wire reinforcement in mortar joints at sixteen (16") inch o.c. vertically in composite masonry walls.

### 3.03 Laying Masonry:

- A. Control Joints: Refer to drawings for location and detailed type of control joints required. In no case shall the spacing of control joints for C.M.U. exceed 40'0" on center and shall also be provided at following specific locations:
  - 1. Install control joints where wall height changes or thickness of masonry changes.
  - 2. Install control joints at any construction joints in foundation, roof, or floors.
  - 3. Install control joints at chases, recesses for piping, columns, fixtures, etc.
  - 4. Install control joints where walls or columns abut (intersecting walls).
  - 5. Caulk/sealant as required.
- B. All masonry units shall be true, plumb, and built to dimensions or patterns indicated on the drawings with head joints breaking approximately over the center of the units in the next course below.
- C. Provisions shall be made for all special units as required to form all corners, returns, openings and offsets.
- D. All head and bed joints shall be filled and made tight. Vertical joints shall be shoved tight.
- E. Masonry shall not be laid when there is danger of freezing before the mortar has set.
- F. Properly install lintels and other special equipment required.

### 3.04 Curing:

Keep joints of masonry units damp, but not saturated for at least four (4) days to prevent too rapid drying during hot and dry weather.

### 3.05 Protection:

- A. Properly protect all masonry surfaces when they are not being worked upon. Also provide

adequate protection against cold weather.

- B. Upon the end of each days work or when work is suspended for any cause, the tops of masonry walls will be covered with a waterproof membrane, well secured in place.
- C. Sills and other projecting members shall be boxed over or otherwise protected during the construction of any work above the same.

3.06 Cleaning and Pointing:

- A. At the completion of the work, all holes and defective joints in exposed masonry shall be pointed and where necessary defective joints shall be cut-out and repointed.
- B. At the completion of the work, clean down masonry surfaces using chemical cleaner and stiff, clean fiber brushes.
- C. Leave masonry clean and free of mortar on faces and in good condition with tight mortar joints throughout.

**Part IV - Masonry Units**

4.01 General:

Submit preliminary samples for selection and approval of color, texture, quality, and appearance. Do not order or deliver for sample panel until preliminary samples have been approved.

4.02 Concrete Masonry Units:

- A. ASTM C90-70
- B. Grade: N. Type I. With minimum compressive strength of 1000PSI on the average gross area.
- C. Type: Loadbearing
- D. Color: Natural cement gray
- E. Size: Nominal 12, 8, or 4 inch x 8 inch x 16 inch hollow units.
- F. Special Shapes: Furnish corner blocks, jamb blocks, filler, closers, lintels, bond beam units, sills, etc. - all units necessary for a complete job. Provide bullnose corners at all masonry openings. Provide mushroom wall cap where noted on the Plans.

End of Section

**SECTION 4450  
STONE WORK & VENEER**

1. WORK INCLUDED:  
Provide all labor, materials, services and equipment necessary for the purchase, delivery and installation of all stone work and veneer.
2. RELATED WORK SPECIFIED ELSEWHERE:
  - A. Section 4200: Masonry
3. SAMPLES:  
Provide stone for sample panel.
4. STORAGE OF MATERIALS, EQUIPMENT, AND FIXTURES:  
Cover materials when necessary to protect from elements.
5. STONE: Unless other stone is identified on the plans;
  - A. Provide "Glen Rose" buff colored fieldstone ranging from 3 inches to 5 inches thick. Face size should be no smaller than 4 inch x 6 inch nor larger than 12 inches x 18 inches.
  - B. Provide "Millsap" brown, tan or rust colored fieldstone ranging from 3 inches to 5 inches thick. Face size should be no smaller than 4 inches x 6 inches nor larger than 12 inches x 18 inches.
6. PRODUCT HANDLING:  
Comply with Section 1640.
7. MORTAR:  
Type "S" mortar per ASTM C270 proportion specifications shall be used unless otherwise shown on plans.
8. MORTAR JOINTS:  
Joint widths shall be between 1/2 inch and 1 inch. Rake mortar joints to a depth of not less than 1/2 inch and no more than 3/4 inch.
9. TIES & ANCHORS:  
Place non-corrosive masonry ties and anchors as needed to insure stable bond to foundations and walls. At all corners and wall ends use extra ties and when possible large stones.
10. CLEANING:  
At the completion of work, clean down masonry surfaces using a chemical cleaner and stiff, clean fiber brushes. Leave masonry clean and free of mortar on faces and in good condition with tight mortar joints throughout. Apply two coats of Thompson's Water Seal for Stone to finished product per manufacturer's recommendations.

END OF SECTION 4450

## SECTION 07900 JOINT SEALANTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES:

- A. Sealants and joint backing.
- B. Pre-compressed foam sealers .
- C. Hollow gaskets.

#### 1.2 REFERENCES

- A. ASTM C834 - Standard Specification for Latex Sealing Compounds.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- E. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- F. ASTM D1565 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- G. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
- H. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for concrete Pavements .

#### 1.3 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals .
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples, 2" x 2" in size, illustrating sealant colors for selection .

#### 1.4 SUBMITTALS FOR INFORMATION

- A. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

## 1.7 WARRANTY

- A. Section 01700 - Contract Closeout.
- B. Correct defective work within warranty period.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, watertight seal, or exhibit loss of adhesion or cohesion, or do not cure.

## PART 2 PRODUCTS

### 2.1 SEALANTS

- A. The following sealant type shall be used for pavement joints.
  - 1. Concrete Paving Joint Sealant: One part conforming to FS TI-S00227E, Class A, Type I {Self Leveling) and ASTM 920.
  - 2. Color as selected by Owner by submittal.
  - 3. Sealant shall be Urexpan Nr-210, Pecora; Sonolastic SL-1, Sonneborn; or Engineer approved equal.
  - 4. Applications :
    - a. Sidewalk Joints (All Joint Types)
    - b. Pavement Joints {All Joint Types)
- B. The following sealant type shall be used for control joints in masonry walls .
  - 1. Exterior Masonry Joint Sealer: One-part conforming to FS TI-S-00227E, Class A, Type II (non-sag) and ASTM-920.
  - 2. Color as selected by Owner.
  - 3. Sealant shall be Dynatrol I Pecora, or Engineer approved equal.
- C. The following sealant is suitable for normal exterior exposures. The sealants listed are suitable for exterior moving joints above grade and generally all substrates, but not for extreme movement (over 25 percent of joint width), joint width over 1/8 inch, extremely cold (arctic) conditions, chemical exposure, or continuous water immersion. Other unusual exposures should be carefully investigated.
  - 1. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single or multi-component.
  - 2. Color as selected by Owner.
  - 3. Sealant manufactured by Sonneborn, W.R. Meadows, or Engineer approved equal.
  - 4. Applications : Use for :
    - a. Control, expansion, and soft joints in masonry.
    - b. Joints between concrete and other materials .
    - c. Joints between metal frames and other materials.
    - d. Other exterior joints for which no other sealant is indicated.

- D. The following sealant is suitable for dry, non-traffic-bearing joints with very little movement.
  - 1. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable .
  - 2. Colors as selected by Owner
  - 3. Sealant as manufactured by Sonneborn , W.R. Meadows, or Engineer approved equal.
  - 4. Applications: Use for :
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.
    - c. Other interior joints for which no other type of sealant is indicated .
  
- E. The following sealant is suitable for surfaces subject to continuous water immersion. It would not be used where a waterproofing membrane covers the joint.
  - 1. Sealant for Continuous Water Immersion: Polysulfide or Polyurethane; ASTM C920, Grade NS, Class 25, Uses M and A; approved by manufacturer for continuous water immersion; single or multi- component.
  - 2. Color as selected by Owner.
  - 3. Sealant as manufactured by Sonneborn, W.R. Meadows, or Engineer approved equal.
  - 4. Applications: Use for:
    - a. Joints in basins.

## 2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM 01056, sponge or expanded rubber 01565, open cell PVC 01667, closed cell PVC; oversized 30 to 50 percent larger than joint width; provided by same sealant manufacturer.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

### 3.2 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfiguration.

### 3.3 INSTALLATION

- A. Perform installation in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags .
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave or channel shaped.
- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/2 inch below adjoining surface.
- I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/2 inch below adjoining surface.

### 3.4 CLEANING

- A. Section 01700 - Contract Closeout: Cleaning installed Work.
- B. Clean adjacent soiled surfaces.

### 3.5 PROTECTION OF FINISHED WORK

- A. Section 01700 - Contract Closeout: Protecting installed Work.
- B. Protect sealants until cured.

END OF SECTION

## SECTION 07920

### CAULKING AND SEALANTS

#### PART I - GENERAL

- 1.01 DEFINITIONS:
- A. The term "sealant" or "sealing" shall refer to concrete and masonry products installed under this contract. Refer to Divisions 3 and 4.
  - B. "Caulk" or 'caulking', shall refer to exterior joints in flatwork or other concrete products installed under this contract.
- 1.02 SUBMITTAL:
- A. Submit to Owner's representative manufacturer's literature, specification data, and color chart for all materials proposed for this project.
  - B. Identify their use and location.
- 1.03 GUARANTEE: The Contractor shall provide the Owner with a manufacturer's written guarantee on all caulk and sealant materials. The manufacturer shall agree to provide any replacement material free of charge to the Owner. Also, the Contractor shall provide the Architect and Owner a written warranty on all caulked joints and sealed surfaces. The Contractor shall agree to replace any failed caulk joints at no cost to the Owner. Both warranties shall be for two years after final acceptance of the completed work.

#### PART 2-PRODUCTS

- 2.01 SEALANTS: For concrete and masonry to be approved by Owner.
- 2.02 CAULK: As manufactured by Pecora or approved equal.
- 2.03 PRIMERS: Type as manufactured by manufacturer of sealing or caulking material and completely compatible with compound.
- 2.04 JOINT BACKING: Rods or tape in sizes and types as recommended by manufacturer of sealing or caulking material, and completely compatible with compound.

#### PART 3 - EXECUTION

- 3.01 GENERAL:
- A. Work shall be performed by experienced workmen, skilled in execution of type of work required and in application of specified materials.
  - B. Deliver materials to job site in original containers with manufacturer's name and brand clearly marked thereon.
  - C. When perimeter joints around frames that are to be caulked do not have built-in stops or other means to prevent depth of compound from exceeding 1/2 inch, pack joint with back-up materials of correct type and to the depth as necessary to provide minimum 3/8" and maximum 1/2" depth of compound.
  - D. Materials and methods shall be as specified herein, unless they are contrary to approved manufacturer's directions or to approved trade practice; or unless Contractor believes they will not produce a watertight job which he will guarantee

as required. Where any part of these conditions occur, Contractor shall notify Architect in writing. Deviation from procedure specified will be permitted only upon Architect's approval and provided that work is guaranteed by Contractor as specified.

- E. If, prior to beginning work, Contractor does not notify Architect in writing of any proposed changes, it will be assumed that he agrees that materials and methods specified will produce results desired, and that he will furnish required guarantee.

3.02 PREPARATORY WORK:

- A. Where field conditions are not favorable for application or installation of required product, Contractor shall notify Architect of delays and identify conditions to be met before application or installation can commence.
- B. Thoroughly clean all surfaces or joints, etc., that are to be caulked or sealed, prior to executing work.

3.03 PRIMING: When conditions of joints so require, or when types of materials used adjacent to joints so require, or when compound manufacturer's recommendations so require, clean and prime joints or surfaces before starting caulking. Execute priming operations in strict accordance with manufacturer's directions.

3.04 JOINT BACKING: Joint backing shall be installed in all joints to receive caulks. Backing shall be sized to require 20% to 50% compression upon insertion, and shall be placed so that sealant depth is approximately 1/2 joint width. In joints not of sufficient depth to allow backing, install bond breaking tape at back of joint.

3.05 APPLICATION: Apply sealant and caulking material under pressure to fill joint completely, allowing no air pockets or voids. Tool the joint surface to compress the compound into the joint if necessary.

3.06 SILICA SAND: Apply a coat of silica sand over all caulked surfaces. Sand and density of coating to be field approved by Owner.

3.07 STONEMWORK SEALED: All hopped sandstone and flagstone cap items to be sealed with approved product.

3.08 CLEANING: Clean adjacent surfaces free of caulking and sealant and clean all work of other trades that have in any way been soiled by these operations. Finished work shall be left in a neat and clean condition.

END OF SECTION

**SECTION 15400  
PLUMBING**

**GENERAL**

- 1.01 DESCRIPTION  
A. Work included: Provide all labor, materials, services, and equipment necessary for a complete plumbing system installation, including connections, testing and checking
- 1.02 CODE  
A. Comply with all applicable laws and codes, including but not limited to the following:  
1. City Plumbing Code  
2. Applicable state and National codes.  
3. Texas State Department of Health
- 1.03 PERMITS, INSPECTIONS, FEES  
A. Apply for, obtain and pay for all temporary deposits, permits, and inspections. Final deposits for service will be paid by owner
- 1.04 SUBMITTALS  
A. Comply with pertinent provisions of Section 1340.  
B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:  
1. Materials list of items proposed to be provided under this Section.  
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- 1.05 PRODUCT HANDLING  
Comply with pertinent provisions of Section 1640.

**PRODUCTS**

- 2.01 ACCESS DOORS  
A. Provide hinged doors as required for valves, traps, controls, cleanouts, and other related equipment. Hinges shall be concealed type.
- 2.02 WATER SERVICE  
A. Provide type L copper from service location to building as indicated on drawings. Make all connections and place system in operation. Arrange for and pay all costs for tap and meter and house cut-off and drain.(schedule 40 PVC pipe may be used where allowed by code).There must be no piping joints under concrete slabs.
- 2.03 SANITARY DRAINAGE  
A. All sanitary drainage lines (soil, waste, and vent) shall be service weight coated cast iron pipe to a point not less than 5 feet from the foundation lines) ABS plastic or PVC may be used where allowed by code from this point.
- 2.04 HOUSE CUTOFF AND DRAIN  
A. Equal to Hayes 1000 with extension wrench. House in a precast concrete housing with flush hinged cover.
- 2.05 WATER HAMMER PROTECTIVE DEVICES  
A. Provide a manufactured device on each hot and cold water supply line. Equal to Wade Shokstop.

- 2.06 CLEANOUTS  
 A. Provide at each change in direction and at the end of each continuous waste line and at 50' intervals in horizontal lines. Cleanouts shall be equal in size to the line that they are serving, but never larger than 4". Place above floor in accessible locations.

- 2.07 FLOOR DRAINS  
 A. All floor drains shall be equipped with a backwater and cleanout.

2.08 MINIMUM PIPE SIZES IN INCHES

Fixture	Waste	Vent	C. W.	H. W.
flush tank toilet	3	2	1/2	
flush valve toilet	4	2	1	
urinals stall type	3	2	1/2	
urinals wall type	2	1 1/2	1/2	
sinks	1 1/4	1 1/2	1 1/2	1/2
service sink	3	2	3/4	3/4
floor drains	1 1/2	2		
hose bibs		1/2		
drinking fountain	1 1/4	1 1/2	1/2	1/2
lavatories	1 1/4	1 1/2	1/2	1/2
water service			1	
bath/shower	2	1 1/2	1/2	1/2
water heater			1/2	
washer	1 1/2	1 1/2	1/2	1/2
soil stack	4			

- 2.09 ESCUTCHEONS  
 A. Provide for all exposed lines passing through floors, walls, and ceilings.

- 2.10 OTHER MATERIALS  
 A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

**EXECUTION**

- 3.01 SURFACE CONDITIONS  
 A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

- 3.02 INSTALLATION  
 A. Coordinate as required with other trades to assure proper and adequate provision in the work of these trades for interface with the work of this Section.  
 B. Install the work of this Section in strict accordance with the original design, approved Shop Drawings and product data, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Consultant, anchoring all components firmly into position for long life under hard use.  
 C. Water heater shall have 3/4" or larger T & P relief valve through slab to exterior.  
 D. At each group of plumbing fixtures and at each piece of equipment, furnish and install gate valves so that these groups of fixtures or pieces of equipment may be isolated from accessible locations.

End of Section 15400

DIVISION 16 - ELECTRICAL

16010	ELECTRICAL GENERAL PROVISIONS
16011	ELECTRICAL SUBMITTAL REQUIREMENTS
16012	MECHANICAL AND ELECTRICAL COORDINATION
16110	RACEWAYS
16120	WIRE AND CABLE
16122	GROUNDING
16130	BOXES
16140	WIRING DEVICES
16190	SUPPORTS AND HANGERS
16195	ELECTRICAL IDENTIFICATION
16455	MOTOR STARTERS – 600 VOLT AND BELOW
16470	SWITCHGEAR
16475	FUSES
16490	ENCLOSED SAFETY SWITCHES
16510	LIGHTING FIXTURES AND LAMPS
16785	LOW VOLTAGE SYSTEMS - CONDUIT ONLY



*Lee Phillips*  
1/9/17

## SECTION 16010 - ELECTRICAL GENERAL PROVISIONS

### PART 1 - PRODUCTS

#### 1.1 SUMMARY

- A. Provide labor, materials, equipment, services, and incidentals required for complete and functioning electrical systems as required by the contract documents.

#### 1.2 APPLICABLE PROVISIONS

- A. General and Supplementary General Conditions, applicable provisions of Division 1 - General and other provisions of contract documents apply to work of Division 16. Provisions of this section apply to every section of Division 16 - Electrical, except where specifically modified. Sections of Division 16 - Electrical are complementary, interrelated, and mutually binding. Where electrical equipment or work is furnished as a part of equipment or systems supplied or installed under other Divisions, that electrical equipment or work shall comply with the requirements of Division 16, in its entirety. The only allowable exception to this requirement shall be when listing or labeling required under these specifications would be voided by modification or substitution of electrical equipment. Where provisions of these specifications appear to conflict with drawings or other specifications, such conflict shall be identified in writing to the Owner's representative and clarification requested.

#### 1.3 REFERENCE CODES AND STANDARDS

Execute the work in accordance with local, state and national codes, ordinances and regulations having jurisdiction or authority over the work. Make any and all adjustments required by these agencies without further cost to the Owner. In addition, conform to the applicable provisions and recommendations of the following standards:

- A. Association of Edison Illuminating Companies (AEIC).
- B. American National Standards Institute (ANSI).
- C. American Society for Testing and Materials (ASTM).
- D. Insulated Cable Engineers Association (ICEA).
- E. Institute of Electrical and Electronics Engineers (IEEE).
- F. International Energy Conservation Code (IECC).
- G. National Electrical Code (NEC).
- H. National Electrical Manufacturers Association (NEMA).
- I. National Electrical Safety Code (NESC).
- J. National Fire Protection Association (NFPA).
- K. Occupational Safety and Health Act (OSHA).
- L. Texas Accessibility Standards (TAS)

- M. Underwriters' Laboratories (UL).
- N. Serving utilities for electric power, telephone, or cable television.
- O. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified or shown. In the event standards and codes conflict with each other, the most stringent shall apply.
- P. Permits. Secure and pay for all permits, licenses and certificates required as a part of the work. The Contractor shall obtain timely inspections by jurisdictional authorities at such times as are required by those authorities. Costs associated with exposing work not inspected in a timely manner, or testing required by authorities to demonstrate compliance with codes or standards shall be the responsibility of the Contractor.
- Q. Utility Charges. If a utility company in connection with the work under this division makes any charges, the Contractor shall advise the Owner, so that the Owner can pay these charges. Advise the Owner of these charges in a timely manner, so as not to delay construction of the project.

#### 1.4 CONTRACT DRAWINGS AND SPECIFICATIONS

- A. Intent. The intent of the drawings and specifications is to establish the types of systems and functions, but not to set forth each item essential to the functioning of the system. Electrical drawings are generally diagrammatic and show approximate location and extent of work. Install the work complete, including minor details necessary to perform the function indicated. In case of doubt as to work intended, or if amplification or clarification is needed, request instructions from the Owner's representative.
- B. Discrepancies. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies occur between drawings, specifications, and actual field conditions, immediately notify the Owner's representative for his interpretation.
- C. Existing Conditions. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and installing the new work. Failure to comply with this provision shall not constitute grounds for additional payment in connection with removing or modifying part of the existing installations and installing new or temporary work.
- D. Switch, Outlet, and Equipment Locations. Coordinate the actual locations of electrical switches, outlets, and equipment with building features and equipment as indicated on architectural, structural, mechanical and plumbing drawings. Review with the Owner's representative any proposed changes in switch, outlet, or equipment location. Relocation of switches, outlets, or equipment before installation, of up to 5 feet from the position indicated, may be directed by the Owner's representative without additional cost. Remove and relocate outlets placed in an unsuitable location, when so requested.

#### 1.5 CONTRACTOR QUALIFICATIONS

- A. An acceptable Contractor for the work under this division must have personnel with experience, training and skill to provide a practical working system. The Contractor may be required to furnish acceptable evidence of having installed not less than three systems of size and type comparable to this project. The systems must have served satisfactorily for not less than 3 years. The superintendent must have had experience in installing not less than three such systems. The Contractor shall employ and utilize licensed and certified professionals and tradesmen where required by local jurisdictions.

## PART 2 - PRODUCTS

### 2.1 PRODUCT REQUIREMENTS

- A. Condition. Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.
- B. NEC and UL. Products must conform to requirements of the National Electrical Code. Where Underwriters' Laboratories have set standards, listed products and issued labels, products used must be listed and labeled by UL.
- C. Space Limitations. Equipment selected must conform to the building features and must be coordinated with them. Do not provide equipment which will not suit arrangement and space limitations. Where equipment is described by manufacturer's designations, yet alternate manufacturers are designated in the contract drawings as acceptable suppliers, spatial considerations will bear equally with performance criteria in determining the acceptability of alternate equipment.
- D. Factory Finish. Equipment must be delivered with a hard surface, factory-applied finish so that no additional field painting is required except for touch-up as required.

### 2.2 SUBSTITUTIONS

- A. Substitutions will not be considered unless submitted prior to the bid opening or contract award as defined under Division 1. If a product or system is specifically defined on the drawings or in the specifications, requests for substitution will not be considered unless the Contractor can demonstrate that the specified product or system is unavailable within the contract duration. Claims of non-availability must be substantiated by certified letter from the specified supplier stating that the specified product was ordered in a timely fashion and that delivery has become impossible due to factors beyond the supplier's control.

## PART 3 - EXECUTION

### 3.1 PROTECTION OF EQUIPMENT

- A. Moisture. During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately on receiving the products and maintain continually.
- B. Clean. Keep products clean by elevating above ground or floor and by using suitable coverings.

- C. Damage. Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.
- D. Finish. Protect factory finish from damage during construction operations and until acceptance of the project. Satisfactorily restore any finishes that become stained or damaged.

### 3.2 INSTALLATION

- A. Cooperation with Other Trades. Cooperation with trades of adjacent, related or affected materials or operations, and of trades performing continuations of this work under subsequent contracts, is considered a part of this work in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades.
- B. Workmanship. Work must be performed by workmen skilled in their trade. The installation must be complete.
- C. Concrete Equipment Pads. Install 4" thick concrete housekeeping pads for indoor floor-mounted equipment unless direct floor mounting is recommended by the equipment manufacturer or directed on the Drawings. Pour pads on roughened floor slabs and size slabs to extend a minimum of 6" beyond all edges of the equipment. Where several pieces of equipment are grouped, a single pad shall be poured for the group. Trowel pads smooth and chamfer edges to a 1" bevel. Edges shall be dressed smooth to eliminate sharp or irregular surfaces. Secure the equipment to the pad as recommended by the equipment manufacturer.
- D. Setting of Equipment. Equipment must be leveled and set plumb. Use corrosion-resistant bolts, nuts and washers to anchor equipment. In sufficient time to be coordinated with work under other divisions, provide drawings and layout work showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases.
- E. Sealing of Equipment. Seal openings into equipment to prevent entrance of animals, birds and insects.
- F. Motors and Equipment.
  - 1. Motors are specified under other sections of Division 16, but are provided as a part of the associated driven equipment.
  - 2. Electrical work includes the electrical connection of all motors, except those which are wired prior to delivery as a part of equipment. Electrical work also includes the mounting and connection of loose motor starters, disconnects, controls, and alarms furnished with equipment provided under other parts of this contract.
  - 3. Provide, install, and adjust motor overload protective elements sized in accordance with the National Electrical Code and based on the rated motor full load current indicated on each motor nameplate.
- G. Concealed Work. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings except:
  - 1. Where shown or specified to be exposed. Exposed is understood to mean open to view.
  - 2. Where exposure is necessary to the proper function.

3. Where size of materials and equipment preclude concealment.
4. Where conduit is shown concealed below the surface of the floor, conduit must be installed below the floor slab unless written approval has been obtained from the Structural Engineer of Record to allow installation within the concrete slab.

H. Demolition.

1. Unless otherwise noted, remove electrical materials and equipment from areas indicated for demolition.
2. Remove unused conduit to the extent necessary to accommodate new work and where conduit is visible above the floor line. Seal abandoned conduits that remain in place behind walls or in floor slabs. Remove wiring from abandoned conduit.
3. Materials and equipment to be removed, except items specifically listed to be relocated or delivered to the Owner, become the property of the Contractor and must be immediately removed from the project site.
4. Electrical services and controls to items being removed must be disconnected and removed completely to their source of service as a requirement of this section. Where services are removed to a disconnecting means, label the disconnecting means "Spare".
5. Removal of equipment must not interfere with existing operations.

3.3 ELECTRICAL SERVICE

- A. Temporary Service. Provide temporary service sufficient to allow testing of refrigeration equipment, pumps, fans, elevators, and other equipment furnished under other divisions of the Contract Documents. Temporary service shall be available no later than thirty (30) days prior to scheduled substantial completion.
- B. Permanent Service. Coordinate with the Owner's representative and electric utility to establish permanent service no later than seven (7) days prior to scheduled substantial completion. The Contractor shall make such provisions as are required by the utility to establish permanent service. Such provisions may include, but are not limited to, mounting of utility-furnished metering equipment, construction of transformer or switchgear pads or vaults in accordance with utility requirements, installation of grounding, or provision of raceways. Delays in obtaining permanent electrical service caused by the Contractor's failure to identify and comply with utility service criteria shall not be cause for increased costs to the Owner nor extension of the Contractor's contractual duration.
- C. Outages. Schedule power outages to avoid interference with the Owner's activities. Obtain approval from Owner at least thirty (30) days prior to the requested outage. If required by Owner, provide a schedule showing sequence and duration of all activities during the requested outage.

3.4 TELEPHONE SERVICE

- A. Permanent Service. Coordinate with the Owner's representative and telephone utility to establish permanent service no later than seven (7) days prior to scheduled substantial completion. The Contractor shall make such provisions as are required by the utility to establish permanent service. Such provisions may include, but are not limited to, mounting of utility-furnished equipment, installation of grounding, or provision of raceways. Delays in

obtaining permanent telephone service caused by the Contractor's failure to identify and comply with utility service criteria shall not be cause for increased costs to the Owner nor extension of the Contractor's contractual duration.

### 3.5 CABLE TELEVISION SERVICE

- A. Permanent Service. Coordinate with the Owner's representative and cable television utility to establish permanent service no later than seven (7) days prior to scheduled substantial completion. Make such provisions as are required by the utility to establish permanent service. Such provisions may include, but are not limited to, mounting of utility-furnished equipment, installation of grounding, or provision of raceways. Delays in obtaining permanent cable television service caused by the Contractor's failure to identify and comply with utility service criteria shall not be cause for increased costs to the Owner nor extension of the Contractor's contractual duration.

### 3.6 TESTING

- A. Test Conditions. Place circuits and equipment into service under normal conditions, collectively and separately, as may be necessary to determine satisfactory operation. Perform specified tests in the presence of the Owner's representative. Furnish all instruments, wiring, equipment and personnel required for conducting tests. Demonstrate that the equipment operates in accordance with requirements of the drawings and specifications. Special tests on certain items are specified under other sections of Division 16. Where specified that the testing be performed by an independent testing company, an Owner approved NETA certified testing company shall be used.
- B. Test Dates. Schedule final acceptance tests sufficiently in advance of the contract date to permit completion of any necessary adjustment or alterations within the number of days allotted for completion of the contract.
- C. Retests. Conduct retests as directed by the Owner's representative of such time duration as may be necessary to assure proper functioning of adjusted or altered parts or items of equipment. Resultant delays as a result of such necessary retests do not relieve the Contractor of his responsibility under this contract.

END OF SECTION 16010

## SECTION 16011 - ELECTRICAL SUBMITTAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section delineates specific requirements for the submittal of drawings, sketches, documents, catalogs, etc., for electrical materials, equipment, and systems. The requirements herein amplify and further define the requirements for submittals set forth under Division 1. The Contractor shall maintain complete and accurate documentation for all equipment, materials, and systems used on this project. This documentation shall include those shop drawings, reports, catalogs, etc., that are obtained from equipment and system manufacturers or suppliers, as well as those drawings, sketches, and supporting documents that are issued by the Contractor. The Owner maintains his option to have this information submitted as a part of project record documents. Prior to the commencement of any work, the Contractor shall submit the required documentation for review by the Owner's representative. No material, equipment, or system shall be purchased, fabricated, or delivered to the site that is not in accordance with the requirements of its associated specification section. Only submittals regarding those items of equipment or systems which are listed in the following paragraphs of this specification will be reviewed for compliance by the Owner's Representative. Other submittals will be returned without review. Whether reviewed or not, all materials, systems, and work provided under this contract must meet the requirements of the contract documents unless those requirements are specifically altered by contract modification.

#### 1.2 ITEMS REQUIRING COMPLETE SUBMITTALS

- A. For materials, equipment, and systems listed below, the Contractor shall provide a complete submittal of all shop drawings and documents for review and approval of the Owner's representative prior to purchase, fabrication, or commencement of work. For those items not listed, submittals will be returned without review or comment. Compliance with the drawings and specifications remains the sole responsibility of the Contractor.
1. Lighting Fixtures and Lamps
  2. Switchgear (Switchboards, Panelboards, Overcurrent Protective Devices, Transformers, Motor Control Centers, Starters, Elevator Control Switch, Bus Duct, Contactors, Surge Suppression Systems, Safety Switches, Fuses)
  3. Wiring Devices
  4. Fire Alarm System
  5. Area of Rescue System
  6. Lightning Protection System
  7. Emergency Generator and Automatic Transfer Switch
  8. Cable Tray
- B. Submit shop drawings in a single binder. Group product data by sections to include complete descriptions of related systems, products, and accessories.
- C. Submittals shall include but not be limited to the following:
1. Exceptions List. Provide a complete listing of every exception proposed to the requirements of the Contract Documents for the equipment or system submitted. The exceptions list must reference the specific drawing element or specification paragraph to which exception is taken and explain the reason for the proposed deviation. Any

exception found during the course of review which is not noted on this exceptions list will be reason for rejection of the submittal.

2. Brochures. Provide complete brochure information on components which are cataloged and produced without modification as a part of the supplier's standard manufacture.
  3. Layout Drawings and Wiring Details. Where applicable, provide details indicating:
    - a. Wire type, gage, and conduit sizes
    - b. Quantity and location of device or equipment
    - c. Interface connections between system components
    - d. Component terminal identification
    - e. Riser diagrams
    - f. Installation and mounting details
    - g. Equipment dimensions and clearances
    - h. Schematics and one-lines
    - i. Routing details
    - j. Software requirements
    - k. Electrical characteristics and ratings
  4. Test Reports and Calculations. Where submittals are required and performance criteria are specified in the applicable section, the Contractor shall supply certified test reports and/or calculations demonstrating compliance with the specified criteria. Such testing may be performed on identical units manufactured prior to the submittal process. However, when specified, certified test results on the specific items supplied will be required prior to shipment.
  5. Certificates of Compliance. Submit manufacturer's certifications as required for the products, materials and equipment specified in paragraph 1.2. Certificates from distributors or material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents are not acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certifications shall state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.
- D. Resubmittals shall be annotated to correlate with the reviewers' comments received from prior rejected submittals. Each reviewers' comment shall be restated, the submitter's reply appended, and a cross-reference to the specific page and paragraph demonstrating the submitter's response included. When specifically requested by the reviewer, partial resubmittals may be allowed which address specific review comments. Such partial submittals shall be annotated as described herein. When entire submittals are resubmitted, the submitter shall certify that no changes have been made to the original submittal other than those specifically annotated in the response.
- E. The review of shop drawings or catalog data by the Owner's representative shall not relieve the Contractor from responsibility for deviations from plans and specifications unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the Owner's representative thereon; nor shall it relieve him from responsibility for error of any kind in shop drawings. When the Contractor does call such deviations to attention, he shall state in his letter whether or not such deviations involve reduction in cost.

### 1.3 OPERATION AND MAINTENANCE MANUAL

- A. Submit complete sets of operation and maintenance manuals in accordance with Division 1. Approval of the manual will be required prior to substantial completion.
- B. In addition to the requirements of Division 1, the operation and maintenance manual shall include the following:
  - 1. General. The manual shall include the names, addresses and telephone numbers of each Contractor installing products, and of the nearest service representative for each product. The manual shall have a Table of Contents and tab sheets. Update manuals to include modifications made during installation, checkout and acceptance. The manual shall include the Sections described in the following paragraphs.
  - 2. Functional Design Section. The functional design section shall identify operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. Hardware and software functions, interfaces, and requirements shall be provided for system operating modes.
  - 3. Hardware Section. The hardware section shall describe equipment provided, including general description and specifications, installation and checkout procedure, electrical schematics and layout drawings, alignment and calibration procedures, manufacturer's repair parts list indicating source of supply, interface definition, signal identification and wiring diagrams.
  - 4. Software Section. The software section shall describe programming and testing, instruct the user on programming or reprogramming any portion of the system and other information necessary to enable proper system usage.
  - 5. Operation Section. The operation section shall provide instructions for operation of the system, including system startup procedures, use of system and applications software, alarm presentation (where applicable), failure and recovery procedures, preventive maintenance schedule, parameter schedules and sequence definition, and system access requirements. The operating instructions shall demonstrate the equipment's or system's ability to satisfy the performance criteria as specified.
  - 6. Maintenance Section. The maintenance section shall provide descriptions of maintenance for equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components. Provide a list of special tools or instruments required for installation or maintenance. Provide a recommended spare parts list for all equipment including a name, address, and telephone number for a distributor located within 100 miles for each recommended spare part.
  - 7. Warranty Section. The warranty section shall include a detailed list of all equipment covered and the expiration date of warranty for individual equipment components. Provide the name, address, and telephone number of the company providing warranties for each system or piece of equipment.

END OF SECTION 16011

SECTION 16012 - MECHANICAL AND ELECTRICAL COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Refer to Section 15000 – General Requirements for Mechanical Work.

1.2 SUMMARY

A. This Section describes the coordination between the Mechanical and Electrical portions of the work.

B. This Section is included under the Division 15 portion of the Specifications as Section 15012.

1.3 WORK INCLUDED

A. Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
1.	Equipment Motors	15	15	16
2.	Magnetic Motor Starters			
	a. Automatically controlled, with or without HOA switches	15	16	Notes 1,2,3
	b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	15	15	Notes 1,3,5
	c. Manually controlled	15	16	Notes 1,3,5
	d. Manually controlled and furnished as part of factory wired equipment.	15	16	Notes 1,3,5
	e. Furnished in Motor Control Centers	16	16	Notes 1,3,5
3.	Variable Speed (Frequency) AC Drives	15	16	Notes 1,4,5
4.	Line voltage thermostats, time clocks, etc., not connected to control panel systems	15	16	15

ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
5. Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc.	15	15	15
6. Temperature control panels and time switches mounted on temperature control panels	15	15	15
7. Motorized valves, motorized dampers, solenoid valves, EP and PE switches, etc.	15	15	Note 1
8. Alarm bells furnished with equipment installed by Division 15	15	15	15
9. Wiring to obtain power for control circuits, including circuit breaker	15	15	15
10. Low voltage controls,	15	15	15
11. Fire protection system (sprinkler) controls	15	15	Note 8
12. Fire and smoke detectors installed on mechanical units and in ductwork	16	15	Note 2
13. All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment	15	15	Note 1
14. Smoke dampers, and combination fire/ smoke dampers	15	15	Note 7
15. Boiler and water heater controls, boiler burner controls panels.	15	15	15
16. Pushbutton stations, pilot lights	15	15	15
17. Heat Tape	15	15	16
18. Disconnect switches, manual operating switches furnished as a part of the equipment	15	15	Notes 1,5
19. Disconnect switches, manual operating switches furnished separate from equipment.	16	16	16

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
20.	Multispeed switches	15	15	16
21.	Thermal overloads	15	15	15
22.	Control relays, transformers	15	15	15
23.	Refrigeration cycle, cooling tower and controls	15	15	15
24.	Tamper switches for fire protection (sprinkler) system	15	15	16
25.	Flow and/ or pressure switches for fire protection (sprinkler) system	15	15	16
26.	Fire and jockey pump controllers and automatic transfer switch	15	15	Note 6
27.	Alarm bells or horns for fire protection (sprinkler) system	15	15	16
28.	Generator (underground) fuel tank	15	15	--
29.	Generator fuel level indicator	15	15	16
30.	Generator fuel piping from tank to generator	15	15	--
31.	Underground fuel tank leak detection and monitoring system	15	15	15

NOTES:

- (1) Power wiring as defined in Section 16160 of the specifications shall be provided under Division 16; control wiring as defined in Section 16160 of the specifications shall be provided under Division 15.
- (2) Wiring from alarm contacts to alarm systems provided by Division 16; wiring from auxiliary contacts to air handling system controls provided by Division 15. Division 16 shall provide power to smoke detector. Smoke detectors required for all air handling systems 2000 CFM or greater. Refer to other Division 15 specifications, Division 16 and Drawings for more specific requirements.
- (3) For requirements for Magnetic Motor Starters, refer to Division 15 Section 15965 - MOTOR CONTROLLERS.
- (4) For requirements for Variable Speed (Frequency) AC drives, refer to Division 15 Section 15965 - MOTOR CONTROLLERS.
- (5) Disconnect switches, operating switches, starters and other similar items that are factory-mounted, as a part of complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.
- (6) Power wiring from energy source to controllers and automatic transfer switch provide shall be provided under Division 16. Interconnection power and control wiring from controllers and automatic transfer switch to pumps

shall be provided under Division 15 and conforming to Division 16 specifications. Control wiring from automatic transfer switch to generator starter shall be provided under Division 16.

- (7) Division 16 will provide power to all smoke and combination fire/smoke dampers, and will provide control for all such dampers using area smoke detectors.
- (8) Wiring for sprinkler system controls to be provided by Division 15. Wiring from devices to Fire Alarm System to be provided by Division 16.

B. CONNECTIONS: Make all connections to controls that are directly attached to ducts, piping and mechanical equipment with flexible connections.

C. PRECEDENCE

1. In general, piping systems that require a stated grade for proper operation shall have precedence over other systems.
2. Precedence for pipe, conduit and duct systems shall be as follows.
  - a. Building lines
  - b. Structural members
  - c. Soil and drain piping
  - d. Vent piping
  - e. Steam piping
  - f. Condensate piping
  - g. Refrigerant piping
  - h. Electrical bus duct
  - i. Supply ductwork
  - j. Return ductwork
  - k. Exhaust ductwork
  - l. Chilled water and heating water piping
  - m. Automatic Fire Protection Sprinkler Piping
  - n. Natural gas piping
  - o. Domestic hot and cold water piping
  - p. Electrical conduit
3. Lighting Fixtures shall have precedence over air grilles and diffusers.

D. FINAL INSPECTION AND REPORT

1. At the completion of the work, there shall be a meeting of the Mechanical, Electrical and Temperature Control Contractors, representatives of mechanical and electrical equipment manufacturers whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies that they represent, shall be filed with the Owner and Architect.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 16012

## SECTION 16110 - RACEWAYS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of electrical raceway systems.

#### 1.2 REFERENCE STANDARDS

- A. ANSI C80.1 - Rigid Steel Conduit - Zinc-Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing - Zinc-Coated.
- C. ANSI C80.5 - Rigid Aluminum Conduit.
- D. NEMA FB1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
- E. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- F. NEMA TC 3 - PVC Fittings for use with Rigid PVC Conduit and Tubing
- G. UL 1 - Flexible Metal Conduit.
- H. UL 5 - Surface Metal Raceways and Fittings.
- I. UL 6 - Rigid Metal Conduit.
- J. UL 360 - Liquid-tight Flexible Steel Conduit.
- K. UL 467 - Electrical Grounding and Bonding Equipment.
- L. UL 651 - Schedule 40 and 80 Rigid PVC Conduit.
- M. UL 797 - Electrical Metallic Tubing.
- N. UL 870 - Wireways, Auxiliary Gutters and Associated Fittings.
- O. UL 884 - Underfloor Raceways and Fittings.
- P. UL 1242 - Intermediate Metal Conduit.
- Q. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

### PART 2 - PRODUCTS

#### 2.1 CONDUIT AND FITTINGS

- A. Rigid Steel Conduit.

1. Conduit. Rigid hot-dipped galvanized steel (RGS) conduit with zinc-coated threads and an outer coating of zinc chromate.
  2. Fittings. Threaded steel.
- B. Rigid Aluminum Conduit.
1. Conduit. Rigid aluminum (alloy 6063-T1) conduit (RAC).
  2. Fittings. Threaded aluminum.
- C. PVC-Coated Rigid Steel Conduit.
1. Conduit. Same as rigid steel conduit plus a factory-applied, 40-mil-thick covering of polyvinyl chloride (PVC) bonded to the steel.
  2. Fittings. Same as rigid steel conduit fittings plus a factory-applied, 40-mil-thick covering of PVC bonded to the steel.
- D. Intermediate Metal Conduit (IMC).
1. Conduit. Galvanized intermediate steel conduit with zinc-coated threads and an outer coating of zinc chromate.
  2. Fittings. Threaded steel.
- E. Electrical Metallic Tubing (EMT).
1. Conduit. Galvanized electrical steel tubing.
  2. Fittings. Compression type or set screw type, either steel or die-cast, cadmium plated or hot-dipped galvanized.
- F. Rigid Nonmetallic Conduit.
1. Conduit. Schedule 40 polyvinyl chloride (PVC).
  2. Fittings. Solvent weld socket type.
- G. Flexible Metal Conduit.
1. Conduit. Spiral-wound, square-locked, hot-dipped galvanized steel strip. 3/8" aluminum spiral-wound, square-locked conduit may be used for fixture whips not exceeding 6ft in length.
  2. Fittings. One-screw and two-screw for 1-1/2 inches and larger, double-clamp steel or malleable iron, either cadmium plated or hot-dipped galvanized.
- H. Liquid-tight Flexible Steel Conduit.
1. Conduit. Spiral-wound, square-locked, hot-dipped galvanized steel strip plus a bonded outer jacket of PVC.

2. Fittings. Compression type, malleable iron, with insulated throat, either cadmium plated or hot-dipped galvanized.

## 2.2 WIREWAYS

- A. Material. Not less than 16-gage sheet steel.
- B. Dimensions. Cross section dimensions not less than 4 inches by 4 inches.
- C. Finish. Not less than two coats of enamel over a rust-inhibiting prime coat.
- D. Type.
  1. Indoors. NEMA 1.
  2. Outdoors. NEMA 3R or 4X.

## 2.3 SURFACE RACEWAYS AND FITTINGS

- A. Material. Not less than 20-gage sheet steel.
- B. Dimensions. Not less than 2.50-square-inch cross section.
- C. Finish. Not less than one coat of enamel over a rust-inhibiting prime coat.
- D. Type. Two-piece construction.

## 2.4 UNDERFLOOR RACEWAYS

- A. Material. Not less than 14-gage sheet steel rectangular tube.
- B. Dimensions. Not less than 3.25-square-inch cross section for small ducts or 8.00-square-inch cross section for large ducts.
- C. Finish. Factory-applied corrosion-resistant coating.
- D. Type. Supply a system consisting of a 10ft duct sections with factory-processed inserts on 24-inch centers.
- E. Floor Junction Boxes. Supply cast iron floor junction boxes with zinc-coated steel tops. Provide floor junction boxes which can be adjusted to the proper elevation of the ducts with top to the surface of the finished floor. For boxes used in multiple duct systems, provide partitions separating the respective duct runs. Close all unused duct and conduit openings with appropriate fittings. Include linoleum pans where linoleum, vinyl tile, asphalt tile or similar floor covering is specified. Use tapered, wide flange carpet flanges in all carpeted areas.
- F. Service Fittings. Supply high and low potential service fittings as indicated, complete with adapters and locking nipples or supports to ensure strong mechanical installation in inserts. Service fittings for extending wiring connections above the floor must be of heavy die-cast aluminum, substantial in design and construction.

## PART 3 - EXECUTION

### 3.1 CONDUIT AND FITTINGS

- A. Minimum Trade Size. 1/2 inch, except that 3/8-inch flexible metal conduit may be used in lengths not exceeding 72 inches for tap conductors supplying lighting fixtures. All conduit homeruns to panelboards shall have a minimum size of 3/4 inch.
- B. Types According to Use. Use rigid steel conduit throughout the project except as specified below.
1. Use PVC-coated rigid galvanized steel (RGS) where exposed to corrosive atmospheres.
  2. Use EMT in interior walls or ceiling spaces and where exposed when installed more than 8 feet above finished floor in open work areas, mechanical rooms or electrical rooms. Conduit which enters or leaves the top of panelboards or enclosures may be EMT, provided the top of the panelboards or enclosures are a minimum of 5 feet above finished floor and such panelboards and enclosures are located in mechanical or electrical rooms.
  3. RGS or rigid nonmetallic conduit 1 inch and smaller may be embedded in slabs if the slab thickness is a minimum of 5 inches thick.
  4. Use RGS or rigid nonmetallic conduit where installed below grade. All elbows and bends more than 10 degrees installed below grade shall be RGS. All horizontal to vertical transitions shall be made using RGS elbows and RGS conduit stub-ups.
  5. Install marking tape 6" (Brady Identoline or equal) above all conduit installed below grade.
  6. Connect all electrical equipment subject to vibration or movement with liquid-tight flexible metal conduit 24 inches minimum length. Where the equipment is located in a duct or plenum used for environmental air, the length of conduit shall not exceed 4 feet and the conduit shall be flexible metal conduit.
  7. Transitions. Continue the heavier, more protective type conduit application not less than 4 inches into the area where lighter, less protective type conduit is permitted.
- C. Preparation. Place sleeves in walls and floor slabs for the free passage of cables or conduits. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the work. Seal all openings and voids around sleeves through floors and walls. Be sure that plugs or caps are installed before concrete placement begins.
- D. Installation Requirements.
1. Metallic conduits must be continuous between enclosures such as outlet, junction and pull boxes, panels, cabinets, motor control centers, etc. The conduit must enter and be secured to enclosures so that each system is electrically continuous throughout. Where conduits 1-1/2 inches and larger terminate in equipment having a ground bus, such as in switchgear, motor control centers and panelboards, provide conduit with an insulated grounding bushing and extend a suitable grounding wire to the ground bus.
  2. Have rigid nonmetallic conduit adequately solvent welded at joints to form a tight, waterproof connection.

3. Run exposed conduit parallel or at right angles to building or other construction lines in a neat and orderly manner. Conceal conduit in finished areas. Unless otherwise shown, remaining conduit may be exposed. Provide chrome-plated floor and ceiling plates around conduits exposed to view and passing through walls, floors, partitions, or ceilings in finished areas. Select properly sized plates to fit the conduit when securely locked in place.

E. Installation Methods.

1. Install each entire conduit system complete before pulling in any conductors. Clean the interior of every run of conduit before pulling in conductors.
2. Cut all joints square, then thread and ream smooth. Coat cuts, threads or scratches on steel conduit with an approved zinc chromate or with a 90 percent zinc paint. When dry, draw up tight.
3. Make bends with standard ells or conduit bent in accordance with the NEC. Make field bends using equipment designed for the particular conduit material and size involved. Bends must be free from dents or flattening. Use no more than the equivalent of four 90-degree bends in any run between terminals and cabinets, or between outlets and junction boxes or pull boxes.
4. Conduit bodies may be used in lieu of conduit ells where ease of installation and appearance warrants their use.
5. Securely fasten and support conduit to structure or metal framing using hot-dipped galvanized, malleable iron pipe straps or other approved means. Wires of any type may not be used for securing conduits. Branch circuit raceways which are 1 inch or smaller may be attached to wall studs by use of manufactured clips.
6. Provide a No. 30 nylon pulling line in conduits in which wiring is not installed under this work. Identify both ends of the line by means of labels or tags identifying source and room number of source.
7. Suitably cap conduit during construction to avoid water, dirt and trash entrance.
8. Use expansion-deflection fittings on conduit crossing structural expansion joints and on exposed conduit runs where necessary. Provide bonding jumpers across fittings in metal raceway systems.
9. With a coupling, terminate concealed conduit for future use at structural surfaces. Install a pipe plug flush with the surface.
10. Openings around electrical penetrations of fire-resistance rated walls, partitions, floors or ceilings shall be firestopped to maintain the fire resistance rating using approved methods.
11. Install bushings on all fittings 1 ½" and larger.
12. Install and neatly rack conduits parallel with and/or perpendicular to building walls. Do not install conduits diagonal to building walls.

### 3.2 WIREWAYS

- A. Install wireways, where shown, according to NEC Article 362. Field apply a 90 percent zinc paint coating over cuts or scratches before any other finish is applied. Internal wireway dividers shall be employed to segregate conductors into groups of 40 or less to minimize derating requirements.

### 3.3 SURFACE RACEWAYS

- A. Install surface raceways, where shown, according to NEC Article 352. Field apply a 90 percent zinc paint coating to cuts or scratches before any other finish is applied. Securely ground raceway and fittings. Provide bushings at raceway entrances.

### 3.4 UNDERFLOOR RACEWAYS

- A. Install underfloor raceways, where shown, according to NEC Article 354. Install raceways bringing the top of outlets to within approximately 1/8 inch below the finished concrete floor surface. Support ducts at intervals not exceeding 5 feet, with adjustable saddle support. Anchor ducts in place to maintain proper elevation and alignment. Cap duct ends with proper fittings. Install ducts to preserve the uniform 24-inch spacing of inserts. Provide marker screws and escutcheons for inserts adjacent to a junction box, for the last insert at end of duct runs, and on each side of permanent building partitions. Before concrete is poured, seal joints of the assembled raceway system with a sealing compound to exclude concrete and moisture. Locations for outlets will be determined in the field by the Owner. Contractor shall install, wire and connect all fittings, regardless of location, without additional cost to Owner. Service fittings not actually installed as a part of the underfloor duct are the property of the Owner. Deliver fittings in suitable containers at the time of completion. All high potential outlets shall be wired complete with not more than six outlets to the circuit.

END OF SECTION 16110

## SECTION 16120 – WIRE AND CABLE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of insulated conductors.

#### 1.2 REFERENCE STANDARDS

- A. ICEA S-61-402 (NEMA WC 5) - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. IEEE 404 - Standard for Cable Joints.
- C. UL 4 - Armored Cable.
- D. UL 83 - Thermoplastic-Insulated Wires and Cables.
- E. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Provide new insulated conductors of the types, sizes, and ratings specified herein or indicated on the drawings. Installation shall include all connectors, termination kits, and other accessories necessary for a complete cable system.

#### 2.2 MATERIALS

- A. Listing.
  - 1. Single Conductor. UL 83.
  - 2. Tray Cable. UL 1277.
  - 3. Armored Cable. UL 4, type ACT-HH.
- B. Conductors shall be 98 percent conductivity, soft-drawn, annealed copper. Unless otherwise noted on the drawings, conductor insulation shall be THHN/THWN for general wiring. The minimum voltage rating for insulated conductors shall be 600V.
- C. Conductor ampacity rating shall be equal to or greater than the ampacity rating of the overcurrent device that serves the conductors. Conductors will not be permitted to be served by the next higher standard rated overcurrent device.
- D. For general wiring use No. 12 minimum. Where branch circuit length to the first outlet exceeds 50 feet, minimum wire size shall be No. 10 for 208/120V and 240/120V circuits. Where branch circuit length to the first outlet exceeds 100 feet, minimum wire size shall be No. 10 for 277/480V circuits. For field-installed control wiring use No. 14 or larger stranded conductors. For tray cable (Type TC) provide a multiconductor cable consisting of insulated conductors as

described in the preceding paragraph with an overall outer sheath. Use a nonmetallic sheath that is moisture, sunlight and corrosion resistant and flame retardant, specifically approved for this purpose.

- E. Conductor sizes shown on the Contract Documents are selected based upon use with 75°C terminations. Furnish terminations, which are UL listed for 75°C, or derate conductors for use at 60°C. Use of 90°C terminations is acceptable, but conductor must be sized at the 75°C rating. Do not use 90°C rating for conductors.
- F. All wire shall be color-coded. Mark conductors on each end with a 1-inch band of colored pressure-sensitive plastic tape applied according to manufacturers instructions.

### 2.3 ARMORED CABLE

- A. Armored cable is specifically not allowed in new construction. For branch circuits installed in existing walls, armored multiconductor cable type MC may be used after obtaining written permission from Owner's Representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Unless otherwise indicated, mechanically protect conductors for systems by installing in raceways. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension or sidewall pressure.
- B. Install conductors in a neat and workmanlike manner to meet code requirements and make runs continuous without weld, splice, or joint between boxes. Do not install wires in conduit unless the entire system of conduit and outlet boxes is permanently in place. Pull conductors using a UL approved wire lubricant.
- C. Provide conductors continuous from outlet to outlet with no splices except at outlets. Leave sufficient wire at all outlets to make connections without straining.
- D. Completely and thoroughly swab raceway system before installing conductors.
- E. Neatly and securely bundle or cable all conductors in an enclosure using nylon straps with a locking hub or head on one end and a taper on the other.
- F. Splice only in junction or outlet boxes.
- G. Make conductor lengths equal for parallel circuits.
- H. Thoroughly clean wires before installing lugs and connectors.
- I. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- J. Terminate spare conductors with electrical tape.
- K. Torque test conductor connections and terminations to manufacturer's recommended values.

- L. Where outlets only are indicated, leave 48-inch leads of conductors, for connection to equipment. Identify all conductors' circuit numbers with Brady tape at terminals and junctions.
- M. Provide green or bare grounding conductor identification for grounding conductors. Identification of all ungrounded conductors at junction boxes, wireways, and/or terminations may be by means of colored tape or painting when color-coded conductors as specified above are not available.
- N. Size all conductors, unless noted otherwise on drawings, in accordance with the overcurrent protective device serving each circuit.
- O. Do not install more than two current carrying conductors and a common neutral in a single raceway for 3-wire, single-phase systems unless specifically noted otherwise on drawings.
- P. Do not install more than three current carrying conductors and a common neutral in a single raceway for 4-wire, 3-phase systems unless specifically noted otherwise on drawings.
- Q. Install a grounding conductor in all raceways.
- R. Install a dedicated neutral conductor for each current carrying conductor on circuits serving receptacles.
- S. Install a dedicated neutral conductor for each current carrying conductor on circuits served by an overcurrent device that contains a ground fault circuit interrupter.
- T. Install a dedicated neutral conductor for each current carrying conductor on circuits served by an overcurrent device that contains an arc fault circuit interrupter.
- U. Use home run circuit numbers as indicated for panelboard connections.

### 3.2 PHASING AND IDENTIFICATION

- A. Colors for each phase and the neutral shall be consistent throughout the system in accordance with the requirements of this section. Use factory-colored insulated conductors for No. 10 and smaller conductors and color code larger insulated conductors with an approved field-applied tape. Use different colors for control wiring. Follow the color scheme below.

<u>Line</u>	<u>208/120</u>	<u>240/120</u>	<u>480/277</u>
A or L1	Black	Black	Brown
B or L2	Red	Orange	Orange
C or L3	Blue	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green
Switch Leg	Purple	Purple	Purple

- B. Where more than one conductor of the same phase or more than one neutral conductor occur at the same outlet or junction box, these conductors shall be identifiable from each other by use of stripes or distinguishing markings.
- C. Phasing of the complete electrical installation shall be connected and maintained the same throughout the power distribution system. Where the project is an addition or modification to

an existing facility, the electrical distribution system phasing shall be made the same as the existing

- D. Switchgear, switches, motor starters, plug-in type bus duct, lighting and power panels and power receptacles shall have all the same phase arrangements throughout the facility.

END OF SECTION 16120

## SECTION 16122 - GROUNDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of grounding and bonding equipment for electrical systems.

#### 1.2 REFERENCE STANDARDS

- A. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- B. IEEE 837 - Qualifying Permanent Connections Used in Substation Grounding.
- C. UL 83 - Thermoplastic-Insulated Wires and Cables.
- D. UL 467 - Grounding and Bonding Equipment.

### PART 2 - PRODUCTS

#### 2.1 GROUND RODS

- A. Materials. Provide 3/4-inch by 10-foot long, copper-clad, steel grounding electrodes. Supply a rod to which the copper cladding is permanently and inseparably bonded to a high strength steel core.
- B. Listing: UL 467.

#### 2.2 COUNTERPOISE LOOP

- A. Where indicated on the drawings, each building shall have a counterpoise loop installed around its perimeter for electrical system grounding, signal reference, and lightning protection. Unless otherwise shown, each loop shall consist of No. 4/0 bare stranded copper conductor buried a minimum of 36 inches below finished grade around the building perimeter. Grounding conductors extending from building to counterpoise loop shall be buried a minimum of 36 inches below finished grade level. Whenever practical, counterpoise cable shall be located a minimum of 10 feet and a maximum of 25 feet from the building foundation. Ground rods shall be installed at nominal intervals of 120 feet along counterpoise loop. A minimum of two ground rods shall be installed as widely separated as possible when the loop length is less than 200 feet. All rods shall be bonded to the loop. Ground rods not connected to test stations shall be buried a minimum of 36 inches below finished grade level.

#### 2.3 CONNECTIONS

- A. Materials. Unless otherwise noted, provide exothermic welded type connections below grade. For above grade connections, or where connections are accessible in ground wells or boxes, provide either exothermic welded connections or approved copper or bronze mechanical compression connectors or clamps meeting the requirements of IEEE 837 and UL 467.

Where required, provide plated connectors which will not cause electrolytic action between the conductor and the connector.

- B. Listing: UL 467.

## 2.4 WIRING

- A. Materials. Provide bare conductors for bonding jumpers. Provide 600-volt insulated conductors having a green-colored insulation for grounding electrode and equipment grounding conductors.
- B. Listing: UL 83.

## 2.5 GROUND BUS

- A. Where a field-provided ground bus is required, use bare stranded copper conductor or round-edge copper bar with 98 percent International Annealed Copper Standard (IACS) conductivity. Size the bus for not less than 25 percent of the cross-sectional area of the largest feeder. A minimum bus size shall be No. 2/0 AWG for bare stranded copper conductor or 1/4 inch by 2 inches for round-edge copper bar.

## PART 3 - EXECUTION

### 3.1 SYSTEM GROUND

- A. System Neutral. Where a system neutral is used, ground the system neutral as required by NEC Article 250. Ground the system neutral only at the point of service and isolate it from ground at all other points in the system.
- B. Separately Derived Systems. Ground neutrals of separately derived systems such as generators, transformers, etc., in accordance with NEC 250-26.
- C. Size. Size the system grounding electrode conductors to comply with NEC Table 250-94, unless shown larger on the drawings.
- D. Testing. Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to ground complies with Code requirements.

### 3.2 EQUIPMENT GROUND

- A. Manholes. Provide a ground bus, either a bare stranded copper conductor or a round-edge copper bar, unless specifically shown otherwise on drawings, in all manholes. Mount bus 12 inches above floor. If bare stranded copper conductor is used as a ground bus, secure conductor to manhole wall with one-hole pipe straps 3'-0" on center around the interior perimeter. If round-edge copper bar is used as a ground bus, secure bar 1 inch from manhole wall utilizing insulated standoffs 3'-0" on center around the interior perimeter. Connect bus to an acceptable grounding electrode, as described in NEC Article 250, with a grounding conductor having a cross-sectional area equivalent to the ground bus. Bond all grounding conductors and noncurrent-carrying metallic components of electrical equipment in the manhole to the bus using lugs or clamps.

- B. Transformer Vaults and Switchgear Rooms. Provide a ground bus, either a bare stranded copper conductor or a round-edge copper bar, unless specifically shown otherwise on drawings, in all transformer vaults and switchgear rooms. Mount bus 12 inches above floor. If bare stranded copper conductor is used as a ground bus, secure conductor to wall with one-hole pipe straps 3'-0" on center around the interior perimeter. If round-edge copper bar is used as a ground bus, secure bar 1 inch from wall utilizing insulated standoffs 3'-0" on center around the interior perimeter. Connect bus to an acceptable grounding electrode, as described in NEC Article 250, with a grounding conductor having a cross-sectional area equivalent to the ground bus. Bond all grounding conductors and noncurrent-carrying metallic components of electrical equipment in the transformer vault or switchgear room to the bus using lugs or clamps.
- C. Raceway Systems and Equipment Enclosures.
  - 1. Ground cabinets, junction boxes, outlet boxes, motors, controllers, raceways, fittings, devices, switchgear, transformer enclosures, other electrical equipment and metallic enclosures. Ground equipment and enclosures to the continuous-grounded, metallic raceway system in addition to any other specific grounding shown.
  - 2. Provide bonding jumpers and ground wire throughout to ensure electrical continuity of the grounding system.
  - 3. Provide grounding-type insulated bushings for metal conduits 1-1/2 inches and larger terminating in equipment enclosures containing a ground bus and connect the bushing to the ground bus.
  - 4. Provide a green insulated equipment grounding conductor for each feeder and branch circuit.
  - 5. Provide a green insulated equipment grounding conductor within each flexible metal conduit. Bond the ground conductor to the equipment or light fixture served by the flexible metal conduit.
- D. Size: When grounding and bonding conductors are not sized on drawings, size the grounding conductors in accordance with NEC Table 250-95. Size bonding jumper so that minimum cross-sectional area is greater than or equal to that of the equivalent grounding conductor as determined from NEC Table 250-95.

### 3.3 COMMUNICATION GROUND

#### A. Telephone:

- 1. Provide one No. 4 THW to main service ground bus from each telephone equipment room. Leave 48" pigtail at telephone board.

#### B. Fire Alarm and Detection:

- 1. Provide one No. 6 THW in 1/2-inch conduit to nearest ground bus.

#### C. Television Distribution System:

- 1. Provide one No. 6 THW in 1/2-inch conduit to nearest ground bus. Leave 48" pigtail at television equipment.

D. Public Address System:

1. Provide one No. 6 THW in 1/2-inch conduit to nearest ground bus. Leave 48" pigtail at public address equipment.

3.4 SWIMMING POOLS, FOUNTAINS AND SIMILAR INSTALLATIONS

A. All work shall be in accordance with Article 680 of the National Electrical Code.

B. Grounding. Provide a complete grounding system for all non-current carrying conductive components and grounded conductors of the electrical distribution system. The following equipment shall be grounded:

1. Through-wall lighting assemblies and underwater light fixtures.
2. All electrical equipment located within 5ft horizontally from the inside wall or 12ft vertically above the maximum water level of the specified body of water.
3. All electrical equipment associated with the water circulating system of the specified body of water.
4. Junction boxes and enclosures.
5. Ground-fault circuit interrupters.
6. Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the specified body of water.

C. Bonding. Provide a bonding system for all conductive components located in the pool area. All parts shall be bonded with #8 AWG or larger conductor. The following parts shall be bonded to the Common Bonding Grid:

1. Metallic structural components. All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones and deck, shall be bonded.
2. All forming shells and mounting brackets for no-niche light fixtures shall be bonded.
3. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts smaller than 4in or those that do not penetrate into the pool structure more than 1in shall not require bonding.
4. Metal parts of electrical equipment associated with the water circulating system shall be bonded.
5. All metal wiring methods located 5ft horizontally from the inside wall or 12ft vertically above the maximum water level of the specified body of water shall be bonded.
6. All metal wiring material located 5ft horizontally from the inside wall or 12ft vertically above the maximum water level of the specified body of water shall be bonded.
7. All chain link or metal fencing located with 10ft horizontally from the inside wall of the specified body of water shall be bonded. If any part of the fencing is located within 10ft horizontally from the inside wall of the specified body of water, the entire fence shall be bonded. Ground rods shall be installed on a maximum of 100ft intervals and bonded to the fence.

D. Common Bonding Grid. The common bonding grid shall be the structural reinforcing steel (non-epoxy-coated) grid of the pool structure and pool deck bond together with steel tie wires. In addition to the tie wires, install one exothermic connection to #6 AWG or larger conductor

for every 1,000 square foot of steel grid. Bonding connections shall be evenly spaced and there shall be a minimum of 25 feet between bonding connections. If epoxy-coated reinforcing steel is used, provide a common bonding grid consisting of #6 AWG or larger conductor.

### 3.5 INSTALLATION

- A. Provide a grounding system that includes all connections and testing of ground rods, grounding cables, ground buses, conduits, fittings, anchors, supports, exothermic welds, and other materials necessary for a complete installation.
- B. Provide grounding cables continuous between connections, without splice. Where grounding cables pass through floor slabs, building walls, or roofs and are not in metallic enclosures, provide sleeves of approved nonmetallic material and seal openings watertight after installation.

END OF SECTION 16122

## SECTION 16130 - BOXES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of outlet boxes, floor boxes, junction boxes and pull boxes.

#### 1.2 REFERENCE STANDARDS

- A. NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- B. UL 514A - Metallic Outlet Boxes.
- C. UL 514B - Fittings for Conduit and Outlet Boxes.

### PART 2 - PRODUCTS

#### 2.1 OUTLET BOXES

- A. Flush Device Boxes. Provide galvanized steel boxes of sufficient size to accommodate wiring devices to be installed at outlet. Provide minimum 2 1/2 inches by 4 inches by 2 inches size box. Square or rectangular boxes minimum 1 1/2 inches deep by 4 inches square with an extension ring shall be provided for devices other than single duplex receptacles or single light switches. Boxes that have more than one conduit connection shall be minimum 1 1/2 inches deep by 4 inches square with an extension ring (single or double gang as required for number of devices installed in box).
- B. Exposed Device Boxes. Provide FS or FD cast boxes for surface mounting in areas having exposed rigid metal conduit systems. Provide galvanized steel boxes for surface mounting in areas having exposed EMT.
- C. Boxes for Lighting Fixtures. Provide galvanized steel octagonal boxes with fixture stud supports and attachments as required to properly support ceiling and bracket-type lighting fixtures. Unless otherwise noted, provide 1-1/2-inch deep by 4-inch box.
- D. Masonry Boxes. Provide galvanized steel, 3-1/2-inch deep, masonry boxes for all devices installed in masonry walls.
- E. Listing. UL 514.

#### 2.2 FLOOR BOXES

- A. Single Service (Power, data, telephone, etc.)
  - 1. Ground level and below: round, cast iron, fully adjustable, Hubbell #B2537 with brass cover and threaded outlets #S3725 for flush outlets and #SC3099/98 series pedestal for surface receptacles. Use #SS309D for single duplex receptacle and #SC309B for back or blank face. Use SB3182 brass carpet flange in areas that have carpet.

2. Above ground level: round, galvanized steel, fully adjustable, Hubbell #B2529 with covers and fittings as described in 2.2.A.1 above.
  3. Ground level and below; telephone and other communication outlets: round, cast iron, fully adjustable, Hubbell #B2536 with brass cover and threaded outlet #S2525 cover for flush outlet and #SC3099/98 series pedestal and SS309T for telephone single outlet. Use #SB3182 brass carpet flange in areas that have carpet.
  4. Above ground level; telephone and other communication outlets: round, galvanized steel, fully adjustable, Hubbell #B2529 with covers and fittings described in 2.2.A.3 above.
- B. Multiple Service (Power, data, telephone, etc.)
1. Rectangular, cast iron, fully adjustable with number of gangs as shown on plans, Hubbell #B4000 series with brass cover and threaded outlets #S3625. Use SB308X series brass carpet flange in areas that have carpet.
- C. Listing. UL 514.

### 2.3 JUNCTION, PULL AND SPLICE BOXES

- A. Construction. Provide galvanized steel boxes conforming to NEC Article 370.
- B. Interior Spaces. Provide NEMA 1 type boxes at least 2 1/8 inches deep unless noted otherwise.
- C. Exterior Spaces. Provide NEMA 3R or 4X type boxes at least 4 inches deep unless noted otherwise.
- D. Embedded. Provide NEMA 4 cast iron type with flush flanged cover when cast in concrete unless noted otherwise.
- E. Listing. UL 514.

### 2.4 FIRE-RATED POKE-THROUGH UNITS

- A. Construction. Through-floor units shall comply with NEC Article 300-21, shall be UL classified for fire and UL listed electrically.
- B. Fire Rating. Through-floor units shall be classified with a fire rating to match rating of floor being penetrated.
- C. Box and Conduit. Underfloor junction box and conduit shall be self-supporting without the attachment of an above-floor fitting. The integral fire barrier must incorporate a cold smoke barrier to prevent the passage of smoke when heat is not present. The junction box shall be 4-11/16 inches square by 2-9/16 inches deep with knockouts to accommodate up to 1-inch conduits. Box and conduit shall be provided with separation barriers for combination power and communication units. Through-floor unit shall allow replacement of original service fittings with different style service fittings of similar or dissimilar service function, including abandonment condition.
- D. Above-Floor Fittings. Provide die-cast aluminum above-floor fitting with satin chrome finished cover. Provide a combination power and communication fitting. Power section shall be equipped with a 20-ampere, 125-volt (NEMA 5-20R) duplex receptacle. Communication section shall have a cover plate with a 5/8-inch bushed opening.

- E. Listings. UL 514.

## PART 3 - EXECUTION

### 3.1 OUTLET BOXES

- A. Coordination. Determine from dimensions shown on the Contract Documents and by actual measurements on the site, the exact location of each outlet. Outlet locations shall be modified from those shown on the plans to accommodate changes in door swings, space changes or to clear other interferences that arise or from job modifications. Make such modifications at no cost to the Owner as a matter of job coordination. Coordinate job conditions and notify the Architect of discrepancies before proceeding with the installation of the work.
- B. Flush Boxes. Unless otherwise indicated, mount all outlet boxes flush within 1/4 inch of the finished wall or ceiling line. Provide galvanized steel extension rings where required to extend the box forward in conformance to NEC requirements. Attach ring with at least two machine screws. Securely fasten outlet boxes. Provide plaster covers for all boxes in plastered walls and ceilings.
- C. Fixture Boxes. Where boxes for suspended lighting fixtures are attached to and supported from suspended ceilings, adequately distribute the load over the ceiling support members. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- D. Mounting Height. Mounting height of a wall-mounted outlet box means the height from finished floor to horizontal center line of the cover plate. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall. Verify the final location of each outlet with Owner's representative before rough-in. Remove and relocate any outlet box placed in an unsuitable location.
- E. Back-to-Back Boxes. Do not connect outlet boxes back to back unless approval is obtained from the Owner's representative. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material. Provide minimum 6 in separation, except provide minimum 24 inch separation in acoustic rated walls.
- F. Box Openings. Provide only the conduit openings necessary to accommodate the conduits at the individual location. Install knockout closures for unused openings.

### 3.2 FLOOR BOXES

- A. Verify locations of all floor boxes with the Owner's representative before installation. Completely envelope floor boxes in concrete except at the top. Increase slab thickness at boxes if required to obtain a minimum of 1 inch of concrete below bottom of box. Adjust covers flush with finished floor.

### 3.3 JUNCTION AND PULL BOXES

- A. Installation. Install boxes as required to facilitate cable installation in raceway systems. Install pull boxes in interior conduit runs at not more than 100 feet intervals when conduit runs are not broken by junction or outlet boxes. Use separate pull boxes and junction boxes for electric power, control, communication and data systems.
- B. Covers. Provide boxes so that covers are readily accessible and easily removable after completion of the installation. Include suitable access doors for boxes above inaccessible ceilings. Select a practical size for each box and cover. Provide hinged cover for enclosures larger than 12 inches in any dimension.

#### 3.4 FIRE-RATED POKE-THROUGH UNITS

- A. Installation. Floor slab or deck shall be core-drilled to accept through-floor conduit unit. Install per manufacturer's recommendations.
- B. Locations. Verify locations of all poke-through units with the Owner's representative before installation.

END OF SECTION 16130

## SECTION 16140 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of wiring devices and device plates. All devices shall be standard products of a single manufacturer.

#### 1.2 REFERENCE STANDARDS

- A. Americans with Disabilities Act (ADA).
- B. Federal Specification W-C-596.
- C. Federal Specification W-S-896.
- D. IEEE 62.41 - Guide for Surge Voltages in Low-Voltage AC Power Circuits.
- E. UL 20 - General-Use Snap Switches.
- F. UL 498 - Attachment Plugs and Receptacles.
- G. UL 943 - Ground Fault Circuit Interrupters.
- H. NEMA WD 1 - General Requirements for Wiring Devices.
- I. NEMA WD 6 - Wiring Devices, Dimensional Requirements.
- J. UL 1449 - Transient Voltage Surge Suppressors.

### PART 2 - PRODUCTS

#### 2.1 WALL SWITCHES

- A. Provide specification grade, quiet type, back and side wired switches rated 20 amperes, 120/277 volts unless otherwise noted. Provide single or double pole switches; single, three, or four way, as shown. Provide switches with high strength toggles and grounding terminals.

#### 2.2 RECEPTACLES

- A. Provide specification grade back and side wired receptacles with NEMA configurations as shown on the drawings. Unless otherwise noted, duplex receptacles shall be NEMA 5-20R with double wipe, corrosion resistant contacts and self-grounding clamps mounted to the mounting strap. Where other than NEMA 5-20R receptacles are shown, provide matching plug caps for use by the Owner. Receptacles incorporating ground fault sensing and clearing (GFI) shall be provided where indicated. Where more than one GFI device is shown on a common circuit, provide GFI devices at each location. Feed-through connections are not acceptable for ground fault protection downstream of a GFI device. Provide integral transient voltage surge

suppression (TVSS) in devices indicated. TVSS receptacles shall provide a minimum of 240 joules surge protection in positive, negative, and zero sequence modes.

### 2.3 DEVICE PLATES

- A. Verify device plate type with Owner's Representative prior to installation. Provide 302 stainless steel (18 percent chromium, 8 percent nickel) standard size device plates for all devices in finished spaces as directed by Owner's Representative. Screws shall match plates in color and finish. Provide device plates of heavy cadmium-plated sheet steel for exposed boxes in dry interior spaces. Edges of plates must be flush with edges of exposed boxes. Provide weatherproof device plates for exterior devices and for interior devices in mechanical equipment rooms. Provide cast plates with gasketed spring door covers for protection of devices.

### 2.4 DEVICE COLOR

- A. Verify device color with Owner's Representative prior to installation.

### 2.5 ACCEPTABLE MANUFACTURERS

- A. Devices and device plates shall be supplied by Hubbell, Leviton, or Pass & Seymour.

## PART 3 - EXECUTION

### 3.1 DEVICE COORDINATION

- A. Where items of equipment are provided under other sections of this specification or by the Owner, provide a compatible receptacle for the cap or plug and cord of the equipment.

### 3.2 WALL SWITCHES

- A. Location. Set wall switches in a suitable outlet box centered at the height as shown on the drawings. Install switch on the strike side of the door as finally hung. Install switches at locations shown on drawings. However, any switch location may be modified by up to 6' prior to installation at the discretion of the Owner's Representative without adjustment to the contract price. Verify all switch locations with Owner's Representative prior to installation.
- B. Position. Install wall switches in a uniform position so the same direction of operation will open and close the circuits throughout the job, generally up or to the left for the ON position.

### 3.3 RECEPTACLES

- A. Location. Mount receptacles in a suitable steel outlet box centered at the height as shown on the drawings. Install receptacles at locations shown on drawings. However, any receptacle location may be modified by up to 6' prior to installation at the discretion of the Owner's Representative without adjustment to the contract price. Verify all receptacle locations with Owner's Representative prior to installation.
- B. Position. Install receptacles vertically with the ground on top. For horizontally mounted receptacles, the ground should be on left.

### 3.4 DEVICE PLATES

- A. Type. Provide device plates for each outlet of the type required for service and device involved.
- B. Ganged Devices. Mount ganged devices under a single, one-piece, device plate.
- C. Engraving. Engrave plates with 1/8-inch-high black letters, if designated for engraving.

END OF SECTION 16140

## SECTION 16190 - SUPPORTS AND HANGERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of metal framing and supporting devices for electrical equipment including channels, fittings, clamps, hardware, electrical accessories and brackets.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Make channels, fittings, clamps, electrical accessories and brackets of sheet steel or of malleable cast iron. Fabricate threaded fasteners of carbon steel.

#### 2.2 COATINGS

- A. Galvanizing. Hot-dip galvanize all steel components.
- B. PVC. At the factory, apply a minimum 10-mil-thick PVC coating, bonded to metal.
- C. Electroplating. Electroplate threaded steel fasteners with cadmium.

#### 2.3 SIZES

- A. Provide continuous slotted channel fabricated from not less than 12-gage sheet steel, 1-5/8 inches wide and not less than 1-5/8 inches deep.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Use hot-dipped galvanized steel components in all areas. Use PVC-coated components when exposed to the weather or when located in a corrosive atmosphere.

#### 3.2 TOUCH-UP

- A. Touch up all scratches, cuts, breaks, welds and other points where the rust inhibiting coating of metal components is damaged with an approved zinc chromate or a 90 percent zinc paint. Use a PVC compound on PVC-coated components.

#### 3.3 INSTALLATION

- A. Carefully lay out supporting devices to coordinate with the work under other divisions of the specifications.
- B. Securely fasten and support conduits and raceways to the building structure.

- C. Suspend horizontal runs of conduits and raceways from the floor and roof construction by rod hangers spaced 10 feet or less on center.
- D. Fasten single runs of conduit to the structure with one-hole pipe straps and beam clamps or hang on rod hangers.
- E. Support multiple runs of conduit and raceways from continuous channel inserts or from trapeze hangers constructed of rod hangers and channels.
- F. Fasten single conduits to rod hangers with adjustable lay-in pipe hangers or for conduits of sizes 2 inches and smaller with Series 6H pipe hangers.
- G. Fasten conduits to channels with pipe channel straps.
- H. Support conduits and raceways within 3 feet of each bend, of each termination, and at other intervals to maintain horizontal and vertical alignment without sag and deformation.
- I. Do not use cable, strap, or wire hangers and fasteners.
- J. Provide riser clamps for conduits at floor lines. Provide wire and cable supports in pull boxes for risers in accordance with NEC.
- K. Install supports to permit equivalently distributed expansion and contraction of conduits and raceways with expansion joints. Use guides consisting of saddles, U-bolts and anchors designed for equivalent effectiveness for both longitudinal and transverse thrusts. Submit complete details for review.
- L. Do not support conduits and raceways from equipment connections.
- M. Provide special supports with vibration dampers to minimize transmission of vibrations and noises, where required.
- N. Provide hangers, racks, cable cleats, and supports for wires and cables in cable chambers and other locations to make a neat and substantial installation.
- O. Provide steel angle and channel supports to the floor and structure for panelboards, cabinets, pull and junction boxes. Provide independent support from entering conduits and raceways.
- P. Provide supports as specified for conduits and raceways for outlet boxes and pull boxes 100 cubic inches and smaller.
- Q. Paint all cuts, breaks, welds and other points where the rust inhibiting coating of supports is damaged.
- R. Provide supports sized to accommodate a minimum of three times the ultimate load to be imposed.
- S. Anchor supporting devices with:
  - 1. Wood screws on wood.

2. Toggle bolts on hollow masonry.
  3. Bolts and expansion anchors in concrete or brick.
  4. Machine screws, threaded rods and clamps on steel.
- T. Provide supports with hot-dipped galvanized finish in outdoor and wet locations.
- U. Pipe and conduit supports:
1. Single run pipe and conduits, 2-1/2" O.D. and less, shall have Type SS8-R or Type SS8-C as manufactured by Portable Pipe Hangers, Inc., or approved equivalent, spaced at maximum eight feet on center and installed on roof pads if required by the roofing manufacturer.
  2. Multiple run pipe and conduits larger than 2-1/2" O.D. shall have Type PS, PSE, PP-10 with Roller, or PP-10 with Bar, as manufactured by Portable Pipe Hangers, Inc., or approved equivalent, spaced at maximum eight feet on center and installed on roof pads if required by the roofing manufacturer. All conduits shall be held in place with clips on bars.

END OF SECTION 16190

## SECTION 16195 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies labels, tapes, nameplates, numbering and other identifications for Division 16 work.

### PART 2 - PRODUCTS

#### 2.1 WIRE AND CABLE MARKERS

- A. Lighting and Power Circuit Wire Markers.
  - 1. Sizes #12 through 3/0 AWG. Brady SCN clip-sleeve wire markers.
  - 2. Sizes 4/0 AWG and larger. Brady HSA heat shrink sleeves, custom printed.
  - 3. Legends. Panel and circuit description; for example "EP1-1", "E1 - 2", "LPA-14".

#### 2.2 EQUIPMENT AND WIRING DEVICE NAMEPLATES

- A. General. White core laminated plastic. White lettering on black background, same style throughout.
- B. Emergency Equipment Nameplates. White lettering on red background.
- C. Fixing. Stainless steel self-tapping screws. Use epoxy adhesive only when NEMA enclosure rating is compromised by screws and for wiring device nameplates.
- D. Switchboard, Motor Control Center, Panelboard, Dry-type Transformer and Control Panel Main Nameplate. 5/8" high block letters.
- E. Other Nameplates. 3/8" high block or condensed letters.

#### 2.3 PANELBOARD CIRCUIT BREAKER IDENTIFICATIONS

- A. Style. Manufacturer's standard labels supplied with panelboard.

#### 2.4 CONTROL PANEL INTERIOR EQUIPMENT NAMEPLATES

- A. Style. White core laminated plastic. White lettering on black background, same style throughout, 3/8" high block or condensed letters.

#### 2.5 GROUND TERMINAL AND BUS IDENTIFICATION

- A. Type. Green paint or dye, factory applied to terminal and bus.
- B. Self-Adhesive Label Legend. "Ground", "Ground Bus", "Equipment Ground Bus" or "Isolated Ground Bus."

## 2.6 UNDERGROUND CONDUIT RUNS

- A. Type. Brady "Identoline" 6" wide over coated polyethylene film 3.5 mils thick, underground warning tapes.
  - 1. Electric line. #91296 (red).
  - 2. Telephone line. #91297 (orange).
  - 3. Customized. Orange
    - a. Fire alarm line.
    - b. Communications line.
    - c. Data line.
    - d. Data/communications line
    - e. Security line.
    - f. CCTV line.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Install nameplates, signs and labels, and engraved wall plates parallel to equipment lines.
- B. Embossed tape will not be permitted for any application.

### 3.2 EQUIPMENT NAMEPLATES

- A. General.
  - 1. Identify panelboards, dry-type transformers and control panels with nameplates showing descriptions or designations on Drawings.
  - 2. Identify disconnect and transfer switches with nameplates describing loads served and panelboard circuit controlling load.
  - 3. Identify receptacles, where the nominal voltage between contact pairs is greater than 150 volts, with nameplates describing the complete circuit number, voltage, and phases.
  - 4. Junction and pull boxes. On the inside cover of junction and pull boxes write in permanent black marker the complete circuit numbers for conductors located in box.
- B. Locations.
  - 1. Switchboards, Motor Control Centers, Distribution Panelboards. Locate main nameplate in center over top wiring gutter. Locate individual nameplates for switches and starters

centrally on device doors. Locate individual nameplates adjacent and to the side of circuit breakers.

2. Lighting and Appliance Panelboards. Locate main nameplate in center of cover approximately 2" down from top of panel.
3. Dry-type transformers. In middle of front cover panel.
4. Other equipment. In middle near top of equipment.

### 3.3 PANELBOARD CIRCUIT BREAKER IDENTIFICATIONS

- A. General. Attach numbered identification to each panelboard circuit breaker in space provided by manufacturer.
- B. Sequence. Arrange numbering to correspond to panelboard pole positions.
- C. Numbering convention. Number poles from top to bottom. Utilize consecutive odd numbers for left side and consecutive even numbers for right side.
- D. Separate sub-feed breakers. Number with last number of panelboard sequence.
- E. Circuit Directory. Prepare a neatly typed circuit directory behind clear heat resistant plastic in a metal frame attached to the inside of the door for each panelboard. Identify circuits by equipment served and by room numbers where room numbers exist. Indicate spares and spaces with light, erasable pencil marking. An adhesive mounted directory pocket is not acceptable.

### 3.4 TERMINAL IDENTIFICATION

- A. General. Identify terminals in control panels and power terminal boxes.
- B. Location. On terminal marker strips.

### 3.5 BELOW GRADE CONDUIT MARKING

- A. General. Provide underground warning tapes for exterior underground conduit runs.
- B. Installation. In continuous length along center line of trench, twelve (12) inches below finish grade level.

END OF SECTION 16195

## SECTION 16455 - MOTOR STARTERS - 600 VOLT AND BELOW

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

A. This section specifies the furnishing and installation of individual motor starters rated 600 volts and below.

#### 1.2 REFERENCE STANDARDS

- A. ANSI C19 - Industrial Control Apparatus.
- B. NEMA ICS - Industrial Controls and Systems.
- C. UL 508 - Industrial Control Equipment.

### PART 2 - PRODUCTS

#### 2.1 MAGNETIC MOTOR STARTER

A. Type. Provide magnetic, full-voltage, nonreversing motor starters unless otherwise indicated. Starters and contactors shall be heavy-duty, industrial type.

B. Overload Relays. Provide an ambient-compensated thermal overload relay in each phase leg. Overload relays shall require manual reset from a single reset button mounted in the starter enclosure door. Overload relays shall include two sets of auxiliary contacts. One set of auxiliary contacts shall cause an annunciator light in the starter enclosure door to illuminate when the overload trips. The annunciator shall have a legend "OVERLOAD TRIPPED".

C. Contactor. Size contactors according to NEMA standards or as shown, but in no case less than NEMA Size 1. Provide main pole in each phase leg, the number and type of auxiliary contacts to perform the required functions, and four spare auxiliary contacts, two normally open and two normally closed. Use double break contacts of silver-cadmium oxide or similar material to minimize sticking or welding. Provide contactor coils suitable for continuous operation at 120 volts, 60 hertz. Provide a minimum of four (4) auxiliary contacts for each contactor coil. At least two contacts shall be wired to terminal blocks for the Owner's use. Additional contacts shall be provided as necessary to allow the interlocking and annunciation required as a part of these drawings and specifications.

D. Control Power Transformer.

1. Voltage. Provide in each enclosure a single-phase control power transformer with a line voltage primary and a 120-volt secondary.
2. Fuses. Fuse both primary lines of the transformer and connect to Line 1 and Line 2. Fuse the secondary line leaving transformer terminal X1. Ground the line leaving terminal X2. Use rejection-type fuse clips and RK-1 type current limiting fuses on the primaries. Coordinate primary fuses with secondary fuse to clear a faulted transformer but not blow on magnetizing inrush current.

3. Size. Provide manufacturer's standard size transformer unless noted otherwise on the drawings.

E. Enclosure. Where starters are not integrated into an original equipment manufacturer's control panel, provide NEMA 12 enclosures for indoor installations and NEMA 4X enclosures for outdoor installations, unless otherwise indicated on drawings.

F. Control Devices. Provide the following control devices mounted in the front of starter enclosures and/or additional devices as indicated on the drawings or as required to accommodate specified control sequences.

1. Selector Switches. Heavy-duty, oil-tight, maintained contact, 3-position, with marked nameplate HAND-OFF-AUTOMATIC, unless otherwise indicated. On two speed starters, provide an additional heavy-duty, oil-tight, maintained contact, 2-position, with marked nameplate HIGH-LOW.
2. Pushbuttons. Heavy-duty, oil-tight, momentary contact or maintained contact, as required, with marked nameplate START-STOP, unless otherwise indicated. START pushbuttons shall be recessed in protective bezels to prevent unintentional contact. Provide locking pushbuttons with twist-to-release 2-inch diameter red mushroom heads where EMERGENCY STOP or EMERGENCY SHUTDOWN buttons are indicated.
3. Indicating Lights. Pilot light assemblies shall be heavy-duty, oil-tight transformer type with rated life of 20,000 hours. Neon lamps are not acceptable. Provide red (running) and green (stopped) lenses. On two-speed starters, provide amber (low speed), red (high speed) and green (stopped) lenses.

## 2.2 COMBINATION CIRCUIT BREAKER-STARTER

A. Provide combination circuit breaker and magnetic motor starter in a common enclosure where combination starters are indicated on the drawings. Provide circuit breakers which are quick-make and quick-break on both manual and automatic operation. Provide a trip-free breaker which is trip indicating. Incorporate inverse time characteristic by bimetallic overload elements and instantaneous characteristic by magnetic trip. For 2-pole and 3-pole breakers, provide the common-trip type so that an overload or fault on one pole will trip all poles simultaneously. Provide circuit breakers with fault ratings equal to or greater than specified on the drawings, but in no case less than 10,000 amperes RMS symmetrical for 250-volt service or 14,000 amperes RMS symmetrical for 480-volt service.

## 2.3 MANUAL MOTOR STARTERS

A. Provide line voltage manual motor starters for single-phase motors as indicated on the drawings. Include bimetallic thermal overload protection in each ungrounded phase leg. Provide toggle-operated starters in NEMA 1 enclosures for indoor installations and NEMA 4X enclosures for outdoor installations, unless otherwise indicated on drawings.

## 2.4 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are Allen-Bradley, Eaton, General Electric and Square D.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install units where indicated on the drawings. In general, mount combination units so that operating handle is approximately 60 inches above finished floor. On non-combination units, mount so that control device is approximately 54 inches above finished floor. Where grouped, align tops of units.

### 3.2 OVERLOAD SETTINGS

A. Set overload relays at maximum values permitted by NEC 430-32, based on actual installed motor nameplate full load amperes.

END OF SECTION 16455

## SECTION 16470 - SWITCHGEAR

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of distribution and branch circuit panelboards.

#### 1.2 REFERENCE STANDARDS

- A. UL 50 - Cabinets and Boxes.
- B. UL 67 - Electric Panelboards.
- C. UL 508 - Industrial Control Equipment.
- D. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- E. NEMA AB 3 - Molded Case Circuit Breakers and Their Application.
- F. NEMA PB 1 - General Instructions for Proper Handling, Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

### PART 2 - PRODUCTS

#### 2.1 SWITCHBOARD CONSTRUCTION

- A. Construct cabinets in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel. Reinforce cabinets and securely support bus bars and overcurrent devices to prevent vibration and breakage in handling.
- B. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide adequate ventilation within the enclosure.
- C. All sections of the switchboard shall align front and rear with depth as shown on the drawings. All protective devices shall be compartmentalized with line and load bus connections. Devices shall be front removable and load connections rear accessible. Insulated rigid copper bus connections shall extend from the load side of over-current feeder devices into rear compartment where outgoing cable connections may be made without reaching into or near the main horizontal or vertical buses. Distribution sections shall be sectionalized to provide a front device section, an intermediate bus section and a rear feeder cable section. There shall be a vertical barrier of glass polyester between the device compartment and the bus compartment.
- D. The assembly shall be provided with adequate lifting means.
- E. The switchboard shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.

## 2.2 PANELBOARD CONSTRUCTION

- A. Construct cabinets in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel. Provide a minimum 4-inch gutter wiring space on each side. Reinforce cabinets and securely support bus bars and overcurrent devices to prevent vibration and breakage in handling. Provide surface-mounted cabinets without conduit knockouts. Surface-mounted panelboards in finished spaces shall have cabinet finishes to match doors and trim as specified below. In unfinished areas such as mechanical and electrical rooms, galvanized sheet steel cabinets are sufficient, provided galvanizing occurs after components are cut or sheared.
- B. Fabricate doors and trim of cold-rolled sheet steel. Equip doors with flush-type combination catch and key lock. Key all locks alike. Fasten trim for panelboards to cabinets by an approved means which permits both horizontal and vertical adjustment. Trim for surface-mounted panelboards must fit the cabinet with no overhang. Apply a finish to trim and doors consisting of two coats of enamel over a rust-inhibiting prime coat.
- C. Fabricate doors and trim of "door-in-door" construction. The outer door shall have a continuous piano hinge on the right side and shall provide full access to the cabinet interior. The inner door shall have a continuous piano hinge on the right side and shall provide access only to circuit breaker operating handles. Fabricate doors and trim of cold-rolled sheet steel. Equip inner doors with flush-type combination catch and key lock. Key all locks alike. Fasten trim for panelboards to cabinets by an approved means which permits both horizontal and vertical adjustment. Trim for surface-mounted panelboards must fit the cabinet with no overhang. Apply a finish to trim and doors consisting of two coats of enamel over a rust-inhibiting prime coat.

## 2.3 INTEGRATED SWITCHGEAR CONSTRUCTION

- A. The manufacturer shall integrate and assemble switchboards and panelboards into a single switchboard as shown on the contract drawings. Each panelboard shall contain a trim with lockable door. The panel shall be recessed in the switchboard enclosure a minimum of four inches from the front of the switchboard to allow easy access to line and/or load conductors entering/exiting top of bottom.
- B. All sections of the switchboard shall align front and rear with depth as shown on the drawings.
- C. The Switchboard shall accommodate two (2) 42-circuit panelboards (225-Amp Main Circuit Breaker or 400-Amp Main Lug Only) per structure, or one, half-height molded case breaker distribution chassis and one (1) 42-circuit panelboard or one, full-height molded case breaker distribution chassis.
- D. Ratings of the switchboards and panelboards shall be as shown on the drawings.
- E. Each structure shall have a wire management system in side wire way to accommodate branch circuit wiring passing through vertically in that section.
- F. Panelboards shall have doors as detailed in Section 2.2.
- G. The integrated switchgear shall be one-piece, bolted together construction. The maximum shipping length of any section shall not exceed 7ft in width or a maximum of two structures bolted together.
- H. The assembly shall be provided with adequate lifting means.

## 2.4 BUS

- A. Fabricate phase, neutral and ground buses of 98 percent IACS conductivity copper with rounded edges. Size bars to withstand symmetrical fault current as indicated on panel schedules and one-line diagrams. All busses shall be fully or series rated for symmetrical fault current withstand. Install buses in allotted spaces so that devices can be added without additional machining, drilling or tapping. Use buses with tin-plated contact surfaces. Include copper ground buses rated not less than the phase bus ampacity and isolated copper neutral buses rated not less than twice the phase bus ampacity.

## 2.5 PROTECTIVE DEVICES

- A. Provide circuit breakers for the specified service with the number of poles and ampere ratings indicated on panel schedules and drawings.
- B. Provide breakers which are quick-make and quick-break on both manual and automatic operation. Use a trip-free breaker which is trip indicating. Incorporate inverse time characteristic by bimetallic overload elements and instantaneous characteristic by magnetic trip. Where indicated, provide ground fault interrupters (GFI) and arc fault interrupters (AFI).
- C. For 2-pole and 3-pole breakers, use the common-trip type so that an overload or fault on one pole will trip all poles simultaneously. Handle ties are not acceptable.
- D. All circuit breakers shall be fully or series rated for symmetrical fault current interrupting. Unless otherwise indicated on panel schedules or drawings, provide circuit breakers with the following interrupting ratings:
  - 1. 10,000 rms symmetrical amperes at rated voltage for breakers rated 120/240 volts, single pole, or 240 volts, multipole.
  - 2. 14,000 rms symmetrical amperes at rated voltage for breakers rated 277 volts, single pole, or 480 volts, multipole.
- E. Connect breakers to the main bus by means of a solidly bolted connection. Use breakers which are interchangeable, capable of being operated in any position within the panel. Independently mount breakers so that a single unit can be removed from the front of the panel without disturbing or removing main bus, other units or other branch circuit connections.
- F. Circuit breakers serving HVAC equipment shall be listed as HACR type.
- G. Circuit breakers serving fluorescent lighting shall be listed as SWD or HID type.
- H. Circuit breakers serving HID lighting shall be listed as HID type.
- I. Provide an integral lock-off device for each circuit breaker.

## 2.6 WIRING / TERMINATIONS

- A. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

- B. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the drawings.
- C. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.
- D. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle-type terminals provided are integral to a device. All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

## 2.7 IDENTIFICATION

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be white core laminated plastic with white characters on black background. Characters shall be 3/8-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.
- B. Control components mounted within the assembly such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.
- C. For each panelboard, provide a steel directory frame mounted inside the door with a heat-resistant transparent face and a directory card for identifying the loads served. Panelboard schedules must be identical to the schedules in the project documents unless there is a technical reason there must be a deviation.

## 2.8 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are Eaton, General Electric, and Square D.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install panelboards in the locations as shown and as recommended in NEMA PB1.

### 3.2 MOUNTING HEIGHT

- A. Install the panelboards such that the center of the switch or circuit breaker in the highest position will not be more than 6-1/2 feet above the floor or working platform.
- B. Install floor mounted equipment on 4" housekeeping pads.

### 3.3 PROTECTION

- A. Permanent doors and trim shall be installed before panelboards are energized. Permanent doors and trim shall be maintained in factory condition after installation. Doors shall remain closed at all times except when the panelboard is deenergized and work is taking place within the panelboard.
- B. Cabinet interiors shall be maintained clean at all times. Cabinet exteriors shall be maintained free of mud, spray-on insulation, paint spray and all substances not placed on the exterior surface by the panelboard manufacturer.

### 3.4 FIELD ADJUSTMENTS

- A. Where field measurements demonstrate a load imbalance in phase-to-neutral loads exceeding ten percent when the panelboard is operating at full demand, relocate and reconnect circuit breakers to achieve load balance within ten percent. If load balance within ten percent appears impractical to achieve, request direction from the Owner's Representative regarding final circuit configuration.
- B. When the drawings require a short-circuit study, protective device evaluation study and/or protective device coordination study, perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study and protective device coordination study.
- C. Necessary field settings of devices, adjustments and minor modifications to equipment to accomplish conformance with an approved short-circuit and protective device coordination study, shall be carried out at no additional cost to the owner.

END OF SECTION 16470

## SECTION 16475 - FUSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

This section specifies the furnishing and installation of low voltage fuses rated 600 volts and below, 6000 amperes and below.

#### 1.2 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses.
- B. UL 198C - High-Interrupting-Capacity Fuses, Current-Limiting Type.
- C. UL 198D - Class K Fuses.
- D. UL 198E - Class R Fuses.

### PART 2 - PRODUCTS

#### 2.1 VOLTAGE

Provide fuses with a voltage rating suitable for the nominal voltage of the system in which they are to be applied.

#### 2.2 TYPES

- A. Time Delay Fuses. Unless otherwise indicated, provide UL Class RK-5 time delay, current limiting fuses having 200,000 rms symmetrical amperes interrupting rating. Use on all 600-ampere or smaller circuits supplying individual motors and transformers, and where otherwise indicated.
- B. Non-Time Delay Fuses. Fuses indicated by "K-1" on the drawings are UL Class RK-1 non-time delay having 200,000 rms symmetrical amperes interrupting rating. Use on all 600-ampere or smaller circuits supplying branch circuit panelboards, resistance heating and where otherwise indicated.
- C. Class L Fuses. Fuses rated 601-6000 amperes are UL Class L with 200,000 rms symmetrical amperes interrupting rating.
- D. Cable Limiters. Provide cable limiters rated 600 volts with tubular-type terminals for compression connection to cable. Cable limiters shall be compatible with the cable to be protected.

#### 2.3 MANUFACTURER

Low voltage fuses must be products of a single manufacturer.

#### 2.4 ACCEPTABLE MANUFACTURERS

Acceptable manufacturers are Bussman, Gould-Shawmut, and Littelfuse.

### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Instructions. Follow the manufacturer's installation instructions.
- B. Fuse Clips. Check fasteners on fuse clips for tightness when installing fuses.
- C. Labels. Install fuses so label is in an upright, readable position. Fuses without labels are not acceptable.

### 3.2 SPARE FUSES

As spares, provide the greater amount of either three fuses or 10 percent of each size and type installed. Deliver the spare fuses to the Owner at the time of final acceptance of the project. Neatly encase the spare fuses in suitable containers or cabinets.

END OF SECTION 16475

## SECTION 16490 - ENCLOSED SAFETY SWITCHES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of enclosed safety switches.

#### 1.2 REFERENCE STANDARDS

- A. UL 98 - Enclosed and Dead-Front Switches.
- B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches.

### PART 2 - PRODUCTS

#### 2.1 CHARACTERISTICS

- A. Voltage. Provide switches with a voltage rating of 250 volts d-c, 240 volts or 600 volts a-c, as required for the installed system voltage.
- B. Type. Provide switches conforming to NEMA KS 1 standard for Type HD (heavy duty).
- C. Contacts. Provide switches with quick-make, quick-break contacts, rated minimum 30-ampere at designated voltage, unless noted otherwise.
- D. Poles. Unless otherwise shown, provide 3-pole, visible blade switches.

#### 2.2 CONSTRUCTION

- A. Enclosure. Provide NEMA 1 switch enclosures for indoor dry locations and NEMA 3R for outdoor locations unless otherwise shown.
- B. Operating Handle. Provide a handle suitable for padlocking in the OFF position with as many as three padlocks of 5/16-inch diameter shank. Use a defeatable, front accessible, coin-proof door interlock to prevent opening the door when the switch is in the ON position and to prevent turning the switch ON when the door is open.
- C. Terminal Shield. Provide incoming line terminals with an insulated shield so that no live parts are exposed when the door is open.
- D. Neutral. Provide each switch with an isolated, fully rated neutral block.
- E. Ground. Provide each switch with a ground lug.
- F. Fuse Holders. Where fusible switches are shown, provide switches with rejection-type fuse holders which are suitable for use with fuses specified.
- G. Nameplates. Provide metal nameplates, front cover mounted, that indicates the switch type, catalog number and horsepower rating (with both standard and time delay fuses).

- H. Service Entrance. Safety switches furnished as service entrance switches shall be suitable for such use. Provide each switch with a neutral bus and SE label.

### 2.3 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are Eaton, General Electric, and Square D.

### PART 3 - EXECUTION

- A. Install switches where indicated on drawings. In general, mount so that operating handle is approximately 60 inches above finished floor. Where grouped, align tops of switches.

END OF SECTION 16490

## SECTION 16510 - LIGHTING FIXTURES AND LAMPS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of lighting fixtures complete with lamps and other accessories.

#### 1.2 REFERENCE STANDARDS

- A. AASHTO - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
- B. ANSI C78 Series - Lamps.
- C. ANSI C82 Series - Ballasts.
- D. UL 844 - Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
- E. UL 935 - Fluorescent-Lamp Ballasts.
- F. UL 1029 - High-Intensity-Discharge Lamp Ballasts.
- G. UL 1570 - Fluorescent Lighting Fixtures.
- H. UL 1571 - Incandescent Lighting Fixtures.
- I. UL 1572 - High-Intensity-Discharge Lighting Fixtures.
- J. UL 1574 - Track Lighting Systems.

### PART 2 - PRODUCTS

#### 2.1 LIGHTING FIXTURES

- A. Lighting fixtures are specified by type and manufacturer in the lighting fixture schedule on the drawings. Provide only fixtures listed in the lighting fixture schedule. Where fixture listings appear incomplete or may be superseded by more recent fixture offerings from the listed manufacturer, request clarification from the Owner's Representative during the submission process. Provide complete fixture assemblies including lamps, ballasts, integral controls, protective fusing, poles, support arms, and all other accessories indicated for a complete, operational lighting system. Where fixtures are subject to moisture, provide damp location (DL) or wet location (WL) label on fixtures as required for the location

#### 2.2 LAMPS

- A. Provide lamps for lighting fixtures. Types are specified in the lighting fixture schedule. Use incandescent lamps rated for 130-volt service unless otherwise indicated. Use energy saving type fluorescent lamps. Where specific lamp product numbers are included in the lighting fixture schedule, equivalent products from other acceptable manufacturers may be used, only if

approved by the corresponding fixture manufacturer. Acceptable lamp manufacturers include General Electric, Osram/Sylvania, Philips, and Venture.

1. Fluorescent: 3500 K, instant start, T-8, 32 watt unless noted or scheduled otherwise, with initial lumens at least 3100, Philips F32T8/TL735 or approved substitute.
2. Incandescent: Inside frosted, 130 volt, general service unless noted or scheduled otherwise.
3. Metal halide: Phosphor coated, unless noted or scheduled otherwise. Use self-extinguishing type which self-extinguish if outer glass envelope is broken.
4. High-pressure sodium: Color-improved diffuse-coated, for any burning position unless noted or scheduled otherwise.

## 2.3 BALLASTS

- A. General. Provide lighting fixture ballasts as required and of compatible design to lamps specified.
- B. Fluorescent. Provide fixtures with Class P ballasts with power factor greater than 0.95 and Class A sound ratings. Provide fully electronic programmed start ballasts for T5, T8 and compact fluorescent lamps. Provide fully electronic rapid start ballasts for T12 fluorescent lamps. Provide ballasts with ballast factors greater than 0.95, crest factor less than 1.7, FCC Class A compliance for RFI/EMI, and total harmonic distortion less than 20%. Use ballasts tested or approved by Underwriters Laboratories, Electrical Testing Laboratories and Certified Ballast Manufacturers. Fluorescent ballasts for exterior use shall be rated to start reliably at temperatures as low as 0°F. Fluorescent dimming ballasts shall be UL approved, Class P thermally protected, and provide a smooth and continuous without flicker to 5% light level for T-8 and T-5 lamps. Provide ballasts with ballast factor no less than 0.93, total harmonic distortion less than 10% and lamp current crest factor less than or equivalent to 1.6. Acceptable manufacturers of fluorescent ballasts are Advance, MagneTek, Motorola, Osram/Sylvania, and Valmont. Provide a ballast disconnect integral to the fixture. The ballast disconnect shall have a latch and shall interrupt both phase and neutral conductors.
- C. Metal Halide. Provide electronic or magnetic pulse start ballasts. Magnetic ballasts shall have an integral ignitor shut off device that disables the ignitor from the ballast circuit 15 minutes after power is applied to the ballast. Ballasts must be suitable for operation in ambient temperatures from -20°C through 55°C. Acceptable manufacturers are Advance, Valmont, and the listed lighting fixture manufacturers.
- D. High-Pressure Sodium. Provide constant wattage ballasts with high power factor. Ballasts must be suitable for operation in ambient temperatures from -20°C through 55°C. Acceptable manufacturers are Advance, Valmont, and the listed lighting fixture manufacturers.

## 2.4 LENS

- A. Lenses for fluorescent fixtures shall be virgin acrylic and have a minimum thickness of 0.125 inch.

## 2.5 POLES

- A. Provide poles for lighting fixtures as shown on the drawings. Pole configurations, materials, finishes, and appearance shall comply with information provided in the drawings. Pole designs shall be in conformance with AASHTO criteria for 90 mph sustained winds with a 30% gust factor. The designs shall include the full exposed projected area (EPA) of the pole, lowering systems (if required) and lighting brackets, lighting fixtures, and accessories. The supplier of the lighting standards shall be responsible for ascertaining the EPA of each entire assembly.

## 2.6 EXIT LIGHTS

- A. Furnish and install exit lights as indicated in the Contract Documents.
- B. Provide single or double face unit as required for each location with arrows as required to clearly define the path of egress, whether shown on the drawings or not. Provide battery powered exit lights, for ninety minute duration, if exit lights are not served with an emergency power source.
- C. Locate fixtures on the ceiling or wall as required by the Architect.

## 2.7 BATTERY PACKS

- D. Where fluorescent fixtures are shown in the Contract Documents to have battery back up, provide battery pack inverter equivalent to the following Bodine products.

Lamp	Battery Pack Bodine #	Lumen Output (one lamp)
T5	B30	1350
T8	B50	1350
F50BX	B50	900
PLT 42/4P	B84CG	1000
PLT 32/4P	B84CG	750
PLT 26/4P	B84CG	600
PLT 18/4P	B84CG	400
PLC 26/4P	B84CG	675
PLC 18/4P	B84CG	500

## PART 3 - EXECUTION

### 3.1 COORDINATION

- A. Verify that the lighting fixtures are compatible with the specified ceiling systems as indicated on the architectural drawings. Advise the Owner's representative of any discrepancies before placing the lighting fixture order.

### 3.2 INSTALLATION

- A. Fixtures must be completely wired and lamps installed. Lighting fixtures must be operating properly at final completion.
- B. Provide hangers and support members for fixtures as required for proper installation. Provide all necessary appurtenances for a complete installation which may include stud supports, stems, mounting brackets, frames, or plaster rings. Check the architectural finishes, and provide fixtures with proper trim, frames, supports hangers, and other hardware as required to coordinate with proper finishes, regardless of specified or scheduled catalog number, prefixes and suffixes
- C. Support fixtures from the building structure or from furring channels. Furring channels must be a minimum size of 1-1/2 inches.
- D. Flexible metal conduit from junction box to lighting fixture shall not touch the ceiling as finally installed.
- E. Immediately prior to final inspection, clean all fixture surfaces, both internal and external. Adjust all trims to match adjacent surfaces and repair light seals and gaskets. Replace any lamps which have accumulated more than 500 hours operation during construction.
- F. Test and aim floodlights, after dark, to provide a uniform and widespread illuminated area. Direct units as indicated or instructed by Owner's Representative. Direct units to prevent objectionable glare .

### 3.3 EXTERIOR LIGHTING CONTROL

- A. Furnish a complete exterior lighting control system as indicated in the Contract Documents with additional work as required herein.
- B. Provide material and equipment to properly interface timing devices and photocells with relays and contactors as required to render a complete and satisfactory operating system.

### 3.4 UL LISTED CEILING ASSEMBLIES

- A. Provide special mounting, enclosures, and fire saving as required by authorities having jurisdiction to maintain integrity of UL listed ceiling assemblies where applicable.

END OF SECTION 16510

## SECTION 16785 - LOW VOLTAGE SYSTEMS - CONDUIT ONLY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section specifies the furnishing and installation of necessary equipment, materials and services to provide terminal boards, outlet boxes and raceways for low voltage systems.
- B. Low voltage systems shall be defined as telephone, cable tv, fire alarm, data, and security systems.

#### 1.2 COORDINATION

- A. The location of the service entrance must be coordinated with the telephone company. Provide materials and equipment required to enable the telephone company to connect service to the project.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Outlets. Each telephone and data outlet shown on the drawings shall consist of a 4" square outlet box with a single-gang adapter.
- B. Conduit. In interior spaces use EMT for telephone service. If service is in or below floor slab or underground, use galvanized rigid steel conduit. Use 3/4-inch minimum conduit.
- C. Terminal Boards. Provide terminal boards at locations shown on the drawings. Each terminal board shall consist of a single piece of 3/4" x 4' x 8' exterior Grade A-A plywood. Prior to mounting, apply two prime coats of gray enamel paint to both sides and all edges of the board. Mount the board securely to the wall with the bottom 6" above finished floor level. Apply two finish coats of gray enamel paint to all exposed areas of the board after mounting. Board orientation should be 4' horizontal and 8' vertical. If ceiling height does not allow for a 8' high terminal board, cut board so that the top of board is 6" below ceiling.
- D. Ground. At each terminal board location, provide a No. 6 AWG minimum ground conductor connected to the building grounding electrode. Leave a 24" coil of ground conductor at each terminal board.
- E. Receptacle. Provide a 20-ampere, 120-volt, NEMA 5-20R quadruplex receptacle at each terminal board location. Connect quadruplex receptacle to a dedicated branch circuit. Mount quadruplex receptacle in horizontal center and 6" above bottom of board.

## PART 3 - EXECUTION

### 3.1 OUTLET BOXES

- A. Install outlets at locations shown on drawings. However, any outlet location may be modified by up to 6' prior to installation at the discretion of the Owner's Representative without adjustment to the contract price. Verify all outlet locations with Owner's Representative prior to installation.

### 3.2 CONDUIT

- A. Install a pull line in each raceway. Label pull line indicating the location of the other end.
- B. Install a 3/4" conduit from each telephone and data outlet to above accessible ceiling. In areas without an accessible ceiling, install a 3/4" conduit from each telephone outlet to nearest telephone terminal board and install a 3/4" conduit from each data outlet to nearest terminal board. All conduit shall be terminated with a connector and threaded plastic bushing.

END OF SECTION 16785

**SPECIFICATIONS  
FOR DENALI STYLE  
FLUSH TOILET BUILDINGS**

**1.0 SCOPE**

This specification covers the construction and placing of the Denali precast concrete flush toilet building as produced by CXT Incorporated.

**2.0 SPECIFICATIONS**

ASTM C33	Concrete Aggregates
ASTM C39	Method of Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Method of Test for Slump of Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, or Concrete
ASTM C192	Method of Making and Curing Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C979	Standard Specification for Pigments for Integrally Colored Concrete
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 306	Cold Weather Concreting
ACI 318	Building Code Requirements Structural Concrete and Commentary (includes Errata)
PCI MNL 116	Quality Control for Plants and Production of Precast Prestressed Concrete Products

### **3.0 MANUFACTURER CRITERIA**

The manufacturer supplying the requested precast concrete flush facility must meet the following:

- A.** Manufacturer must be ISO 9001 certified at the time of bid.
- B.** Manufacturing plant must be PCI certified at the time of bid.
- C.** Manufacturer must not have defaulted on any contract within the last five years.
- D.** Manufacturer must provide stamped, engineered drawings prior to acceptance.
- E.** Manufacturer must be pre-approved prior to bidding.
- F.** Manufacturer must show four examples of precast concrete flush facilities produced, installed and in use as an example of their ability to perform this contract.
- G.** Manufacture shall provide a 20 year warranty.

Manufacturers meeting these criteria are:

CXT, Incorporated  
Spokane Industrial Park  
3808 North Sullivan Road, Building 7  
Spokane, WA 99216  
Phone: 800-696-5766

### **4.0 DESIGN CRITERIA**

The Denali has been designed to individually meet the following criteria. Calculations and Engineer's stamped drawings are available, for standard buildings, upon request by the customer and are for their sole and specific use only. The design criteria are to ensure that the Denali not only will withstand the forces of nature listed below but to provide protection from vandalism and other unforeseen hazards.

#### **A. Snow Load**

- 1. The Denali will withstand a snow load of 250 pound per square foot snow load.

#### **B. Floor Load**

- 1. The Denali is designed to withstand 400 pounds per square foot floor load

**C. Wind Load**

1. The Denali will withstand the effects of 150 mile per hour (3-second gust) wind exposure C

**D. Earthquake**

1. The Denali will withstand the effects of a seismic group 1 design category E earthquake.

**E. Additional Design Standards**

1. The Denali is designed to meet the requirements of the sixty-inch turning radius inside toilet room specified by the American with Disabilities Act Requirements and Uniform Federal Accessibility Standards as of the date of these specifications.
2. The Denali is an all concrete design with a minimum 7/12 roof pitch.
3. The Denali shall have a minimum 4 inch wall, 4 ½ inch roof, and 5 inch floor thickness.
4. All wall to floor interior surface seams shall have a minimum 1” radius coving made of high strength grout.

**5.0 MATERIALS**

**A. Concrete - General**

The concrete mix design will be designed to ACI 211.1 to produce concrete of good workability.

1. Concrete will contain a minimum of 675 pounds of cementitious material per yard. Cement will be a low alkali type I/II or III conforming to ASTM C-150
2. Coarse aggregates used in the concrete mix design will conform to ASTM C33 with the designated size of coarse aggregate #67.
3. Minimum water/cement ratio will not exceed .45.
4. Air-entraining admixtures will conform to ASTM C260. Water reducing admixtures will conform to ASTM C494, Type A.
5. If Self Compacting Concrete (SCC) is used, it must conform to ASTM C1611

**B. Colored Concrete**

1. Color additives will conform to ASTM C979. A 12”x12”x1” color sample will be available for customer approval.
2. The following will contain colored concrete:
  - a. Toilet building roof panels
  - b. Building walls
  - c. Screen panels

3. The same brand and type of color additive will be used throughout the manufacturing process.
4. All ingredients will be weighed and the mixing operation will be adequate to ensure uniform dispersion of the color.

#### **C. Cold Weather Concrete**

1. Cold weather concrete placement will be in accordance with ACI 306.
2. Concrete will not be placed if ambient temperature is expected to be below 35 degrees F. during the curing period unless heat is readily available to maintain the surface temperature of the concrete at least 45 degrees F.
3. Materials containing frost or lumps of frozen materials will not be used.

#### **D. Hot Weather Concrete**

The temperature of the concrete will not exceed 95 degrees F. at the time of placement. When the ambient reaches 90 degrees F. the concrete will be protected with moist covering.

#### **E. Concrete Reinforcement**

1. All reinforcing steel will conform to ASTM A615. All welded wire fabric will conform to ASTM A185.
2. All reinforcement will be new, free of dirt, oil, paint, grease, loose mill scale and loose or thick rust when placed.
3. Details not shown of drawings or specified will be to ACI318.
4. Steel reinforcement will be centered in the cross-sectional area of the walls and will have at least 1 1/4" of cover on the under surface of the floor.
5. The maximum allowable variation for center-center spacing of reinforcing steel will be 1/2".
6. Full lengths of reinforcing steel will be used when possible. When splices are necessary on long runs, splices will be alternated from opposite sides of the components for adjacent steel bars. Lap bars #4 or smaller a minimum of 12". Lap bars larger than #4 a minimum of 24 bar diameters.
7. Reinforcing bars will be bent cold. No bars partially embedded in concrete will be field bent unless approved by the customer.

#### **F. Sealers and Curing Compounds**

1. Curing compounds, if used, will be colorless, complying with ASTM C309, type I or 1-D.
2. Weatherproofing sealer for exterior of building will be a clear water repellent penetrating sealer.

#### **G. Caulking, Grout, Adhesive and Sealer**

1. Caulking service temperatures from -40 to +194 degrees Fahrenheit.
2. Interior and exterior joints will be caulked with a paintable polyurethane sealant.
3. Grout will be a non-shrink type and will be painted to match the color of surrounding concrete as nearly as possible.
4. Cement base coating is formulated with a very fine aggregate system and is a built in bonding agent.

#### **H. Paint**

1. All paints and materials will conform to all Federal specifications or be similar “top-of-the-line-components”. Paints will not contain more than .06 percent by weight of lead.
2. Type of paints for toilets
  - a. Inside concrete surfaces
    - I Interior floors will be a chemical resistant urethane. The color will be gray.
    - II Interior walls and ceilings will be a modified acrylic, water repellent penetrating stain. The color will be white followed by a clear acrylic anti-graffiti sealer.
  - b. Metal surfaces both inside and out
    - I DTM ALKYD
  - c. Exterior concrete surfaces
    - I Exterior slab will be clear sealer
    - II Exterior walls and roof will be a water repellent penetrating stain in the same color as the walls or roof followed by a clear acrylic anti-graffiti sealer

#### **I. Grab bars**

Grab bars will be 18 gauge, type 304 stainless steel with 1-1/2” clearance. Grab bars will each be able to withstand 300 pound top loading.

**J. Toilet Paper Dispenser**

Dispenser will be constructed of 1/4" thick, type 304 stainless steel. Dispenser will be capable of holding three (3) standard rolls of toilet paper. Toilet paper holder fastening system will be able to withstand 300 pound top loading.

**K. Steel Doors**

1. Doors will be flush panel type 1-3/4" thick, minimum 16 gauge Galvanized steel, top painted with DTM ALKYD.
2. Door frames will be knockdown or welded type, single rabbet, minimum 16 gauge prime coated steel top painted with DTM ALKYD, width to suit wall thickness. Three (3) rubber door silencers will be provided on latch side of frame.

**L. Door Hinges**

Door hinges will be 3 per door with dull chrome plating 4-1/2"x4-1/2", adjustable tension, automatic-closing for each door.

**M. Lockset**

1. Lockset will meet ANSI A156.2 Series 4000, Grade 1 cylindrical lockset for exterior door.
2. Lever handle both inside and out
3. Either handle operates latch unless outside handle is locked by inside push-button.
4. Push-button will automatically release when inside lever handle is turned or door is closed.
5. Emergency slot on exterior so door can be unlocked from the outside with a coin, screwdriver and etc.
6. Inside lever always active.
7. U.S. 26D finish.

**N. Dead Bolt**

Deadbolt will be a Lori Lock standard model with a double cylinder, 2 3/4" backset, and US26D finish. The cylinder will be a standard 1 1/8" Schlage Mortise cylinder with compression ring and 626 finish.

**O. Door Stop**

Doorstop will be a dome style stop meeting ANSI 156.16.

**P. Double Coat Hook**

Coat hook will be 304 stainless steel 16 gauge (1.5mm), formed construction with a satin finish and have 3/16"x 7/8" nail in anchor. Upper hook will extend at least 2-1/2" inches from the wall. Lower hook will extend at least 1-1/4" from the wall.

**Q. Door Sweep**

Door sweep will be provided at the bottom of door and will be an adjustable brush type.

**R. Wall Vent**

Wall vent will be crank operated allowing the unit to be opened or closed. Crank will be removable. Vent cover will be 14 gauge 304 stainless steel painted with DTM and anchored into the concrete wall with high strength anti-rust tap con fasteners. Vent to come with insect screen. Cover to be recessed a minimum 3/4" on exterior walls with a 45 degree bevel. Interior to be flush mounted. Wall vent will not protrude from the wall.

**S. Signs**

1. Signs to have raised pictograms, letters and Braille to meet ADA.
2. All signs inset a minimum of 3/4" into wall with 45 degree bevel.
3. All signs to be anchored into concrete with 1/4" x 3/4" concrete anchor nails.

**T. Windows**

1. Window frames will be constructed from steel.
2. Window glazing will be 3/16" thick translucent pebble finished mar-resistant Lexan.
3. Windows to have 3/4" recess with 45 degree bevel.
4. Window frames to have vandal resistant fasteners.

**U. Plumbing**

1. All fixtures to meet ANSI A112.19.2
2. Waste and vent material will be ABS or PVC plastic and will be plumbed to meet Uniform Building Codes.
3. Water material will be copper tubing Type L, hard drawn. A gate

valve will be provided at the inlet end of the water line. All water lines will be of a size to provide proper flushing action based on a nominal water pressure of 40 psi.

4. All plumbing will be concealed in the service area.
5. Toilet will be constructed of vitreous china, wall hung, with siphon jet action. Toilet will have a back spud for a concealed flush valve connection and will be mounted with the top of the seat 18 inches above the finished floor. Seat will be heavy duty solid plastic with an open front. Optional stainless steel fixtures available.
6. Flush valve will be concealed closet flush-o-meter constructed of rough brass. Furnish valve with integral vacuum breaker and wall mounted push button. Valve will be of a water saver type with a flow of 1.6 gallons per flush.
7. Lavatory will be vitreous china with back splashguard, front overflow opening, equipped with brass trap and drainpipe without stopper. Sink will be 20 inches wide x 18 inches front to back x 5 ¾ inches deep with ADA trap cover. Optional stainless steel fixtures available.
8. Water valve will be self-closing water set with indexed push button.
9. Hose bib available in the chase area.
10. A main shut-off valve and drain will be provided with plumbing.
11. Hammer arrester to be installed on water line.
12. Trap primer distribution unit shall be installed.
13. Optional Instant-Flow tankless electric water heater. Temperature rise of 75 degrees at .5gpm with a temperature preset of 104 degrees.

## **V. Electrical**

1. All components UL listed
2. All electrical wiring will be in conduit, surface mounted in the service area and concealed in the user compartments. All wire will be copper.
3. A 200-amp NEMA 3R breaker panel will be provided and must be mounted on the exterior of the building to meet electrical code.
4. The chase area will have, cast in both common walls, lexan windows to allow light into each toilet room with Two (2) 4-foot 3 bulb wall mounted low temperature ballast light fixture.
5. 2 exterior 35-watt High Pressure Sodium lights, polycarbonate vandal resistant.
6. The optional hand dryer is an air compression type with remote motor unit. Push button switch located in cast nozzle housing with flexible hose connecting blower motor, housing and nozzle. Power input 120VAC, 7A (non-heated air).
7. One GFI outlet located next to the sink.
8. Two restroom area exhaust fans HVI certified, with 270 CFM speed controlled (control in chase area)
9. Lighting on the exterior of building will be photocell activated;

interior will be motion activated; override switch in chase/utility room.

## **6.0 MANUFACTURE**

### **A. Mixing and Delivery of Concrete**

Mixing and delivery of concrete will be in accordance with ASTM C94, section 10.6 through 10.9 with the following additions:

1. Aggregate and water will be adjusted to compensate for differences in the saturated surface-dry condition.

### **B. Placing and Consolidating Concrete**

Concrete will be consolidated by the use of mechanical vibrators. Vibration will be sufficient to accomplish compaction but not to the point that segregation occurs.

### **C. Finishing Concrete**

1. Interior floor and exterior slabs will be floated and troweled.
2. All exterior building walls and exterior screen walls will be any one of the available textures.
3. All exterior surfaces of the roof panels will be cast to simulate any one of the available textures. The underside of the overhang will have a smooth finish.

### **D. Cracks and Patching**

1. Cracks in concrete components which are judged to affect the structural integrity of the building will be rejected.
2. Small holes, depressions and air voids will be patched with a suitable material. The patch will match the finish and texture of the surrounding surface.
3. Patching will not be allowed on defective areas if the structural integrity of the building is affected.

### **E. Curing and Hardening Concrete**

1. Concrete surfaces will not be allowed to dry out from exposure to hot, dry weather during initial curing period.

## 7.0 FINISHING AND FABRICATION

### A. **Structural Joints**

1. Wall components will be joined together with two welded plate pairs at each joint. Each weld plate will be 6" long and located one pair in the top quarter and one pair in the bottom quarter of the seam. Weld plates will be anchored into the concrete panel and welded together with a continuous weld. The inside seams will be a paintable caulk. The outside seams will use a caulk in a coordinating building color or clear.
2. Walls and roof will be joined with weld plates, 3"x6" at each building corner.
3. The joint between the floor slab and walls will be joined with a grout mixture on the inside, a matching colored caulk on the outside and two weld plates 6" long per wall.

### B. **Painting/Staining**

1. An appropriate curing time will be allowed before paint is applied to concrete.
2. Some applications may require acid etching. A 30% solution of hydrochloric acid will be used, flushed with water and allowed to thoroughly air dry.
3. Painting will not be done outside in cold, frosty or damp weather.
4. Painting will not be done outside in winter unless the temperature is 50 degrees F. or higher.
5. Painting will not be done in dusty areas.
6. Schedule of finishes
  - a. Inside concrete surfaces
    - I Inside floors will be 1 coat of 1-part water based chemical resistant urethane.
    - II Interior walls and ceilings will be 2 coats of a modified acrylic, water repellent penetrating stain, followed by 1 coat of clear sealer.
  - b. Metal surfaces both inside and out
    - I 2 coats of DTM ALKYD
  - c. Exterior concrete surfaces
    - I Exterior walls will be 2 coats of water repellent penetrating stain in the same color as the walls or roof followed by 1 coat of clear acrylic anti-graffiti sealer.

## **8.0 TESTING**

The following tests will be performed on concrete used in the manufacture of toilets. All testing will be performed in the CXT (PCI certified) laboratories. Testing will only be performed by qualified individuals who have been certified ACI Technician Grade 1. Sampling will be in accordance with ASTM C172.

1. The air content of the concrete will be checked per ASTM C231 on the first batch of concrete. The air content will be in the range of 5.0% +/- 2.0%.
2. The compressive strength of the cylinders will be tested to ASTM C39. We will make one (1) cylinder for release, one (1) for 7-days and one (1) for 28-days. The release must be a minimum strength of 2500 psi, the 7-day must be a minimum of 4500 psi and the 28-day must be a minimum of 5000 psi.
3. A copy of all test reports will be available to the customer as soon as 28-day test results are available.

## **9.0 INSTALLATION**

### **A. Scope of Work**

Work specified under this Section relates to the placement of the unit by CXT on customer prepared foundations.

### **B. Location**

It's the responsibility of the customer to:

1. Provide exact location by stakes or other approved method.
2. Provide clear and level site free of overhead and/or underground obstructions.
3. Provide access to the site for truck delivery and sufficient area for the crane to install and the equipment to perform the contract requirements.
4. Water, electrical, and sewage site connections to be placed per CXT drawings. Must be placed to easily connect to the building.

### **C. Compacting**

The bottom of the area must be compacted after it has been dug out. After the base has been placed, it must be compacted as well. The bearing of the soil and base should be a minimum of 1,500 pounds per square foot.

**D. Base**

After compacting the bottom of the area, a minimum of 6" of a compacted, 3/4" minus material base of gravel (i.e. road base) should be placed for support, leveling and drainage purposes. The base also limits frost action. The base must be confined so as to prevent washout, erosion or any other undermining.

**E. Access to Site**

Delivery to site made on normal highway trucks and trailers. If at the time of delivery conditions of access are hazardous or unsuitable for truck and equipment due to weather, physical constraints, roadway width or grade, CXT may require an alternate site with better access provided to ensure a safe and quality installation. In any such case, additional costs for cranes, trucking, and etc. will be charged to the account of the customer.

**10.0 WARRANTY—PRECAST DIVISION**

CXT provides a warranty against defects in material or workmanship for a period of twenty (20) years on all concrete components. The warranty is valid only when concrete is used within the specified loadings. Furthermore, said warranty includes only the related material necessary for the construction and fabrication of said concrete components. All other non-concrete components will carry a one (1) year warranty. CXT warrants that all goods sold pursuant hereto will, when delivered, conform to specifications set forth above. Goods shall be deemed accepted and meeting specifications unless notice identifying the nature of any non-conformity is provided to CXT in writing within the specified warranty. CXT, at its option, will repair or replace the goods or issue credit for the customer provided CXT is first given the opportunity to inspect such goods. It is specifically understood that CXT's obligation hereunder is for credit, repair or replacement only, F.O.B. CXT's manufacturing plants, and does not include shipping, handling, installation or other incidental or consequential costs unless otherwise agreed to in writing by CXT.

This warranty shall not apply to:

1. Any goods which have been repaired or altered without CXT's express written consent, in such a way as in the reasonable judgment of CXT, to adversely affect the stability or reliability thereof;
2. To any goods which have been subject to misuse, negligence, acts of God or accidents or
3. To any goods which have not been installed to manufacturer's specifications and guidelines, improperly maintained, or used outside of the specifications for which such goods were designed.

**11.0 DISCLAIMER OF OTHER WARRANTIES**

The warranty set forth above is in lieu of all other warranties, express or implied. All other warranties are hereby disclaimed. CXT makes no other warranty, express or implied, including, without limitation, no warranty of merchantability of fitness for a particular purpose or use.

## **12.0 LIMITATION OF REMEDIES**

In the event of any breach of any obligation hereunder, breach of any warranty regarding the goods or any negligent act or omission or any party, the parties shall otherwise have all rights and remedies available at law; however, IN NO EVENT SHALL CXT BE SUBJECT TO OR LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.



## SECTION 17001

### NORTHWEST MODEL

35' X 50'

### SPECIFICATIONS

#### Dimensions:

Roof Dimensions:	35'-0" x 50'-0"
Column Dimensions (Center to Center)	31'-0" x 23'-0"
Minimum Clearance:	8'-0"
Roof Height @ Peak:	±18'-4 3/4"
Gable Roof w/ clerestory:	4:12 & 6:12 pitch
Square Feet Under Roof:	1,750

Columns shall be 8" x 8" steel tube, .188" minimum wall thickness.

All beams shall be structural steel tube sized according to engineering.

Rafter beams shall be one piece construction with mitered corners welded and ground smooth.

All bolts shall be A-325 or A-307 and hidden at all connections.

Roofing shall be 24 gauge R-Panel steel pre-cut and pre-finished with ribs running with the slope of the roof.

Trim shall be 24 gauge pre-finished to match roofing.

Sub-roofing shall be 2" x 6" tongue and groove select grade SPF, rough one side.

Fascia shall be 2" x 4" select grade SPF, rough one side.

Open or welded "C" channels, "I" beams, "S" or "Z" purlins or angle iron shall not be allowed.

Provisions for (2) outlets and (4) lights.

Column wraps by others.

11875 E. Berry Dr. - Dewey, AZ. 86327  
Phone: (928) 775-3307 Fax: (928) 772-0858

[info@classicrecreation.com](mailto:info@classicrecreation.com)  
[www.classicrecreation.com](http://www.classicrecreation.com)



## STANDARD SPECIFICATIONS

w/ TRUZINC RICH PRIMER & SUPER DURABLE POWDER COAT PAINT

### **GENERAL:**

1. All structures shall be designed and fabricated to the IBC (Latest Edition) or current local building code with standard load designs of the greater value of 20# per S.F. minimum live load and 100 mph sustained wind load or site specific conditions and the applicable zone for seismic loads.
2. All members shall be designed according to the "American Institute of Steel Construction (AISC) specifications and the American Iron and Steel Institute (AISI) specifications for cold-formed members.
3. All fabrication welds shall be in strict accordance with the structural welding code of the American Welding Society (AWS) specifications. All structural welds shall be in compliance with the requirements of "Pre-qualified" welded joints. All welding shall conform to ASTM A-233 series E-70XX electrodes - low hydrogen.  
*Field welding shall not be required.*
4. When required, after award of bid, the shade structure manufacturer shall submit structural calculations, sealed by a registered engineer in the state in which the structure is to be erected for review and approval by the approving agency.
5. Manufacturer qualifications: All manufacturers shall have a minimum of (20) twenty years experience in the fabrication of tubular steel shade structures. Shade structure and kiosk fabrication shall be the manufacturer's primary business. Manufacturer shall have fabricated similar structures to that which is specified. All non-specified manufacturers shall submit complete shop drawings indicating type, size & gauge of material used, with detailed connections to the specifying agency or design firm at least 10 days prior to bid opening for review and written pre-approval. All bids submitted without prior approval will be rejected.

### **FOOTINGS & COLUMNS:**

1. Footings shall be structurally engineered by the structure manufacturer to meet local codes and site conditions. (Sample footing drawings shall be made available to the contractor or owner from the manufacturer). When required for structure installation, anchor bolts shall be supplied by the owner / contractor. Columns shall be ASTM 500 grade B. Concrete footing rebar (if required) shall be ASTM A-615 grade 40 #4 bars & smaller, grade 60 #5 bars & larger. Concrete shall be 5 sack mix "Portland" cement. Maximum slump shall not exceed 4". Concrete compressive strength shall be a minimum of 2500 psi @ 28 days.



### **FRAME MEMBERS AND COMPRESSION RING:**

1. 90% of all steel shall be American (domestic) made. Mill certification shall be made available upon request. All frame members shall be one piece structural steel tube with a minimum .120 (1/8") wall thickness, sized according to engineering. All frame members shall be bolted together with bolts totally concealed. All tubing for frame members shall be ASTM 500 grade B. Beam end plates shall be ASTM A36 fy=36,000 psi UNO. Bolts shall be A 307's, or 325's unless noted otherwise.  
*"I" beams, Angle iron, "C", "Z" or "S" purlins or beams, open or closed, shall not be allowed.*

### **ROOFING:**

1. All roofing shall be 24 gauge Zincalume / Galvalume coated steel panels ICBO #ER-2757. "R-Panel" Panels shall be 36" wide with 1¼" high ribs @ 12". All roofing shall be pre-finished with Duratech 5000 or equal, 30 year paint finish. All roof panels shall be pre-cut with ribs running with the slope of the roof. Fascia trim shall be 1 5/8" "J" channel 24 gauge steel Zincalume / Galvalume coated pre-finished to match the roof color. Screws & rivets shall match roof color.

### **SUB-ROOF & FASCIA:**

1. Sub-roof shall be 2"x 6" tongue and groove, select grade SPF, rough 1 side. T&G shall be screwed to the frame with (1) #12-24 x 2½" Phillip flat head w/ wings. (one screw per board per beam connection). Fascia shall be 2"x 4" select grade SPF, rough 1 side

### **PAINT:**

1. All frame members shall be media blasted to a white finish removing all rust, scale, oil and grease. Powder coating for all frame members shall be provisionally warranted for (5) five years with **TRUZINC** 7520-70138 primer with a Dry Film Thickness of (2.0 - 6.0 mils) & hardness of 2H-3H with a Salt Spray Resistance of **6000 hours** and **Super Durable Gloss Polyester 9000** series finish paint (2.5-3.5 mils) with a hardness of H-H2 & has **1000 hour** salt spray resistance. Total of primer & finish paint shall be 4.5-9.5 mils of paint. Finish shall be a smooth uniform surface with no pits, runs or sags. For additional information, please visit <http://www.tcipowder.com/> for a complete list of specifications.

### **ERECTION:**

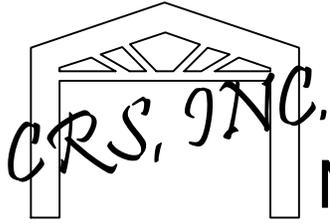
1. Manufacturer shall supply complete layout and detail plans with installation instructions for the structure. The structure shall be erected in a work-man-like manner with framing, roofing and trim installed according to the manufacturer's installation instructions. Care shall be taken to avoid damaging the structure during installation. Touch up powder coat paint with paint provided to prevent rusting. Components of the structure shall be covered and kept dry prior to erection.



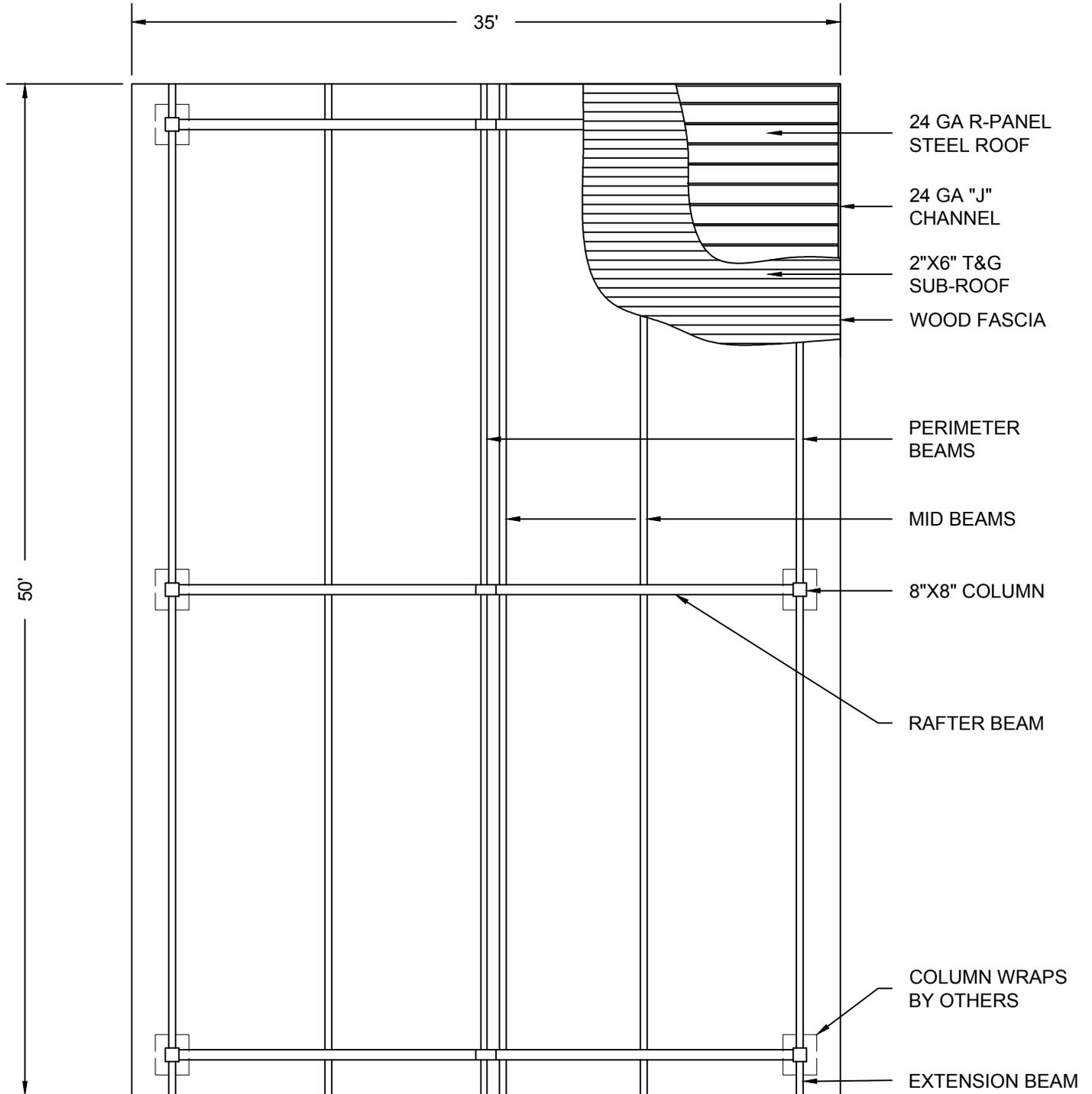
**WARRANTEE:**

1. Manufacturer shall warranty the structure to be free from defects in material and workmanship for a period of (10) ten years from date of acceptance by owner. Warranty does not include damage from theft, fire, vandalism or acts of God. Manufacturer shall repair or replace structure components of like kind at his option, to match existing material and workmanship. Steel roof finish shall be warranted for (30) thirty years under a separate roof manufacturer's warranty. Powder coat paint shall be warranted for (5) five years after acceptance from owner against peeling, flaking and rusting. Warranty does not cover damage caused from shipping, erection of structure, lack of touchup and maintenance, overspray from lawn sprinklers or vandalism. Bolt threads are not powder coated and therefore are not covered under the powder coat warranty.

*NOTE: Engineering specifications take precedence over drawings if differences occur.*

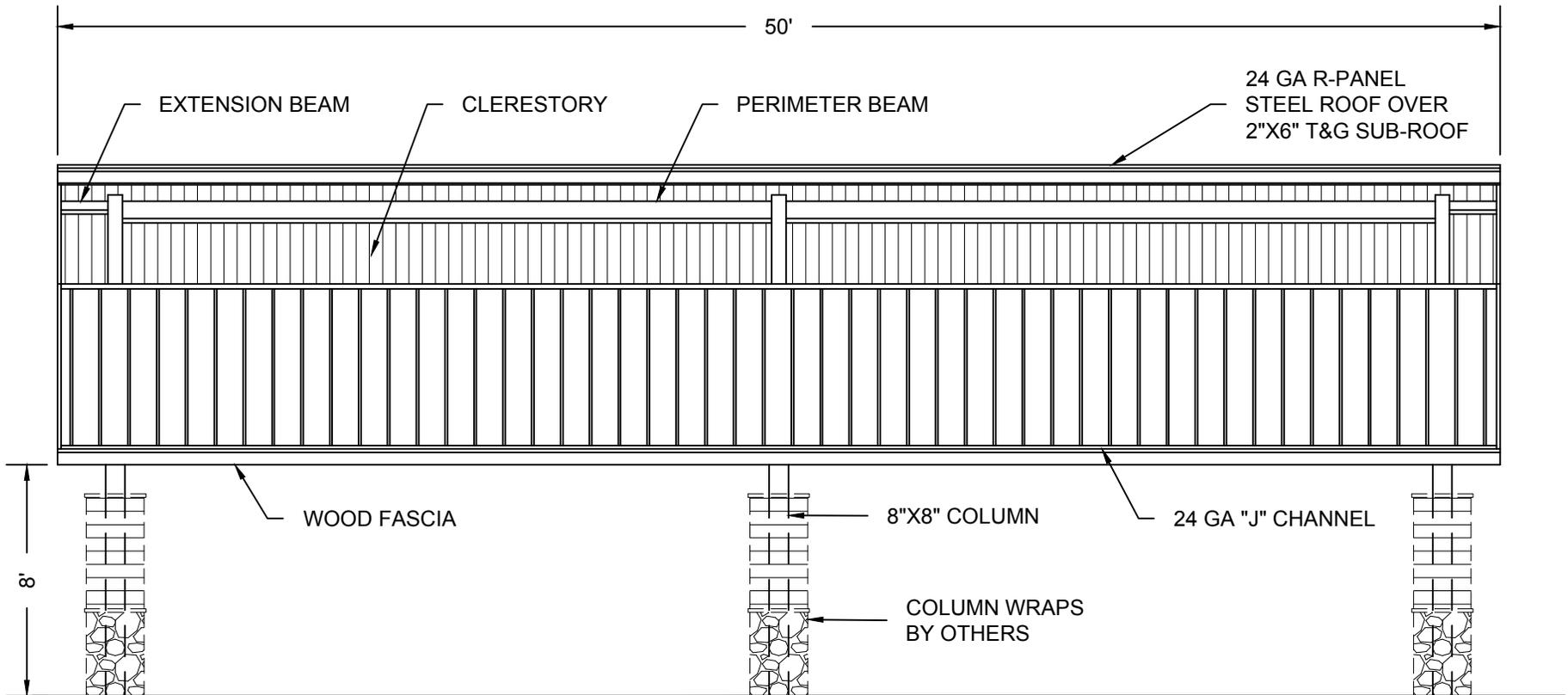
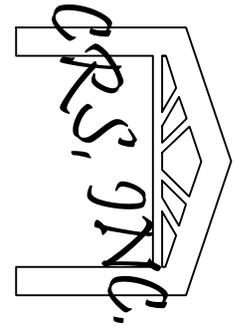


NOT FOR CONSTRUCTION



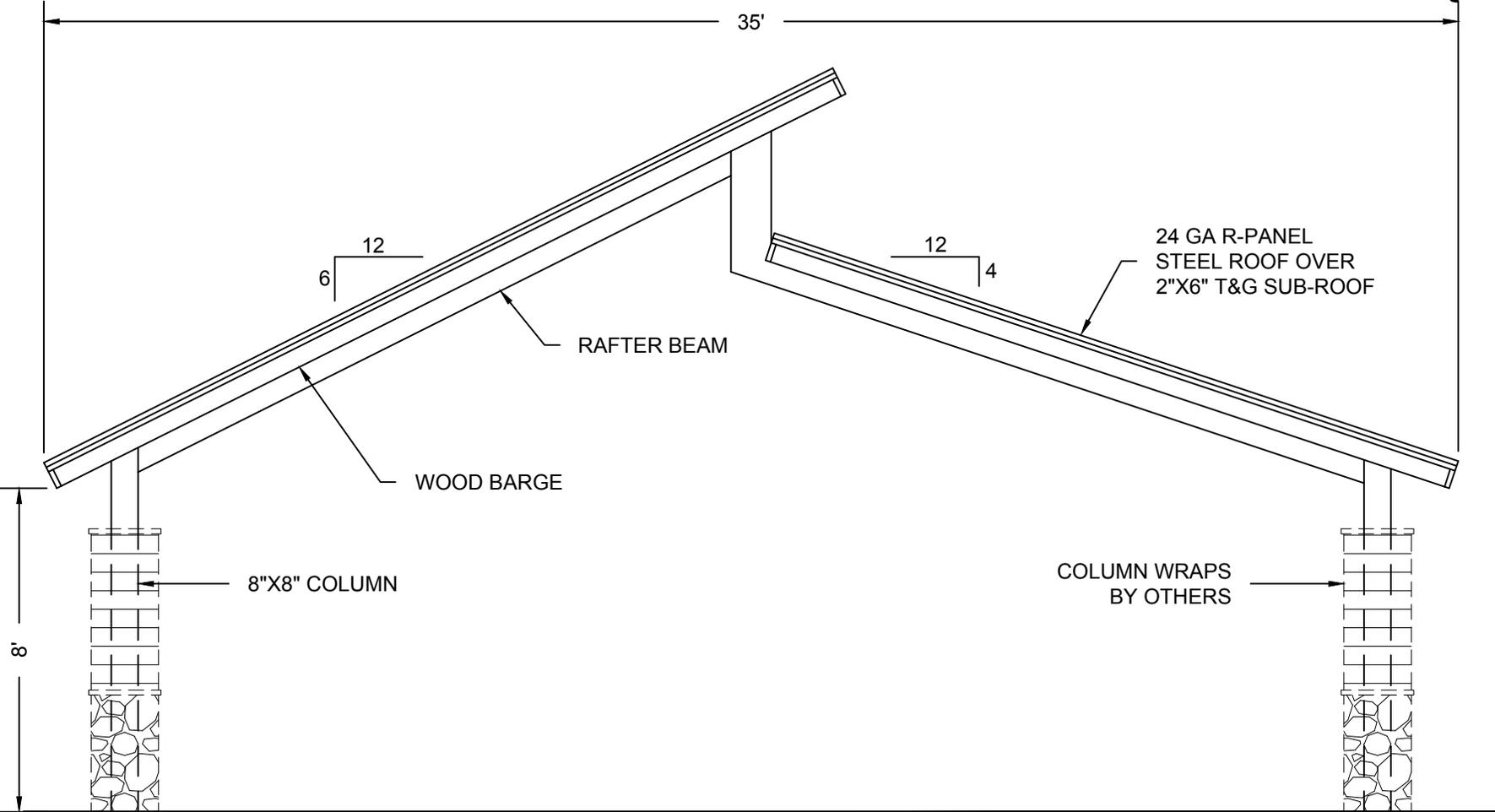
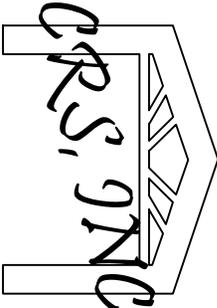
PLAN VIEW 35'X50' NORTHWEST MODEL  
NTS

NOT FOR CONSTRUCTION

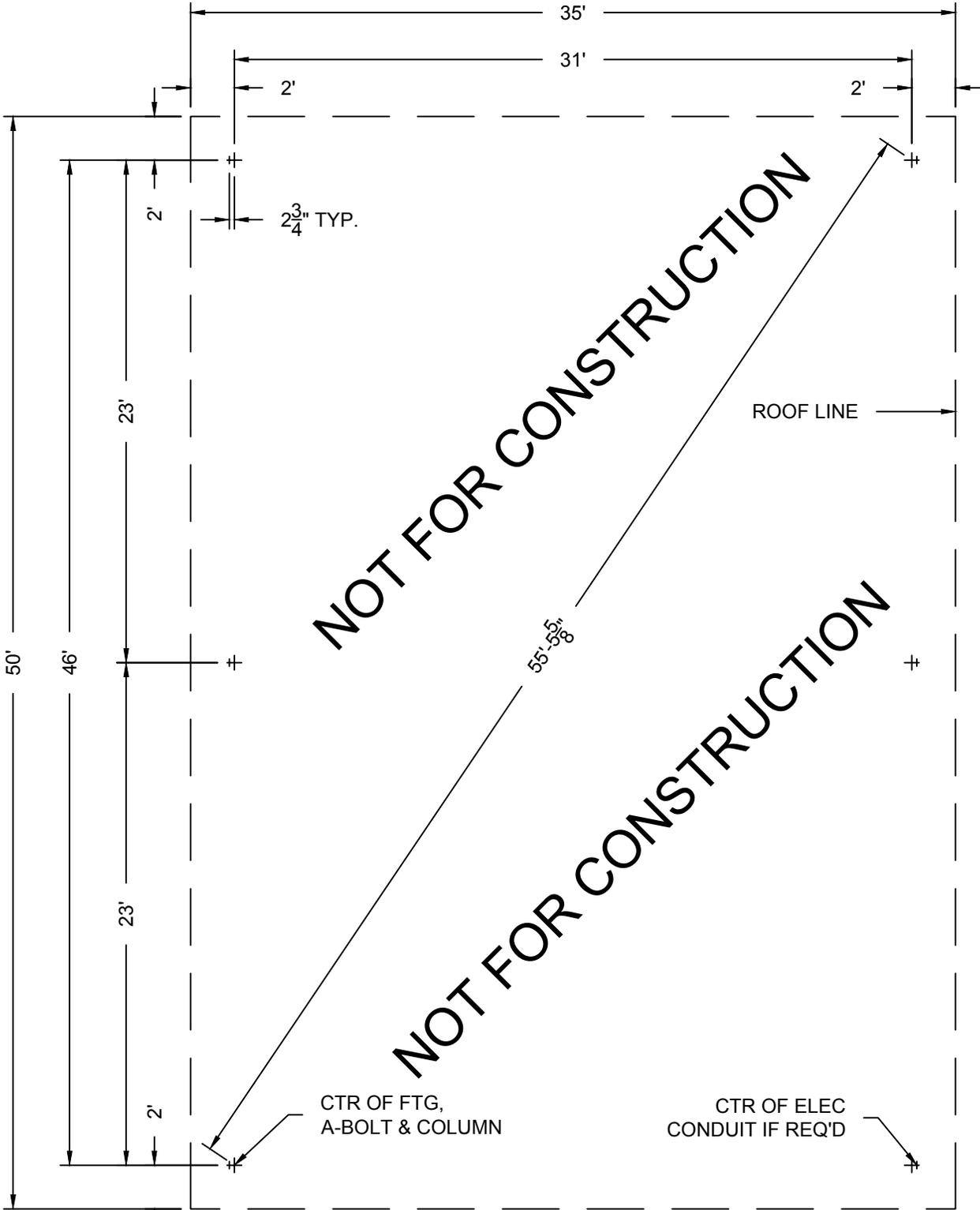
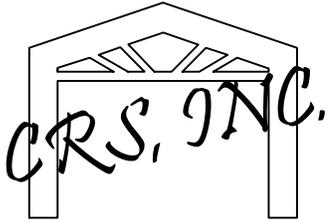


ELEVATION 35'X50' NORTHWEST MODEL  
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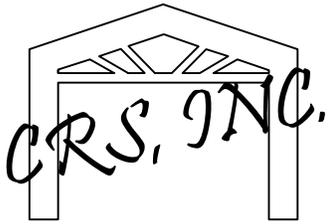
NOT FOR CONSTRUCTION



END ELEVATION 35'X50' NORTHWEST MODEL  
NTS

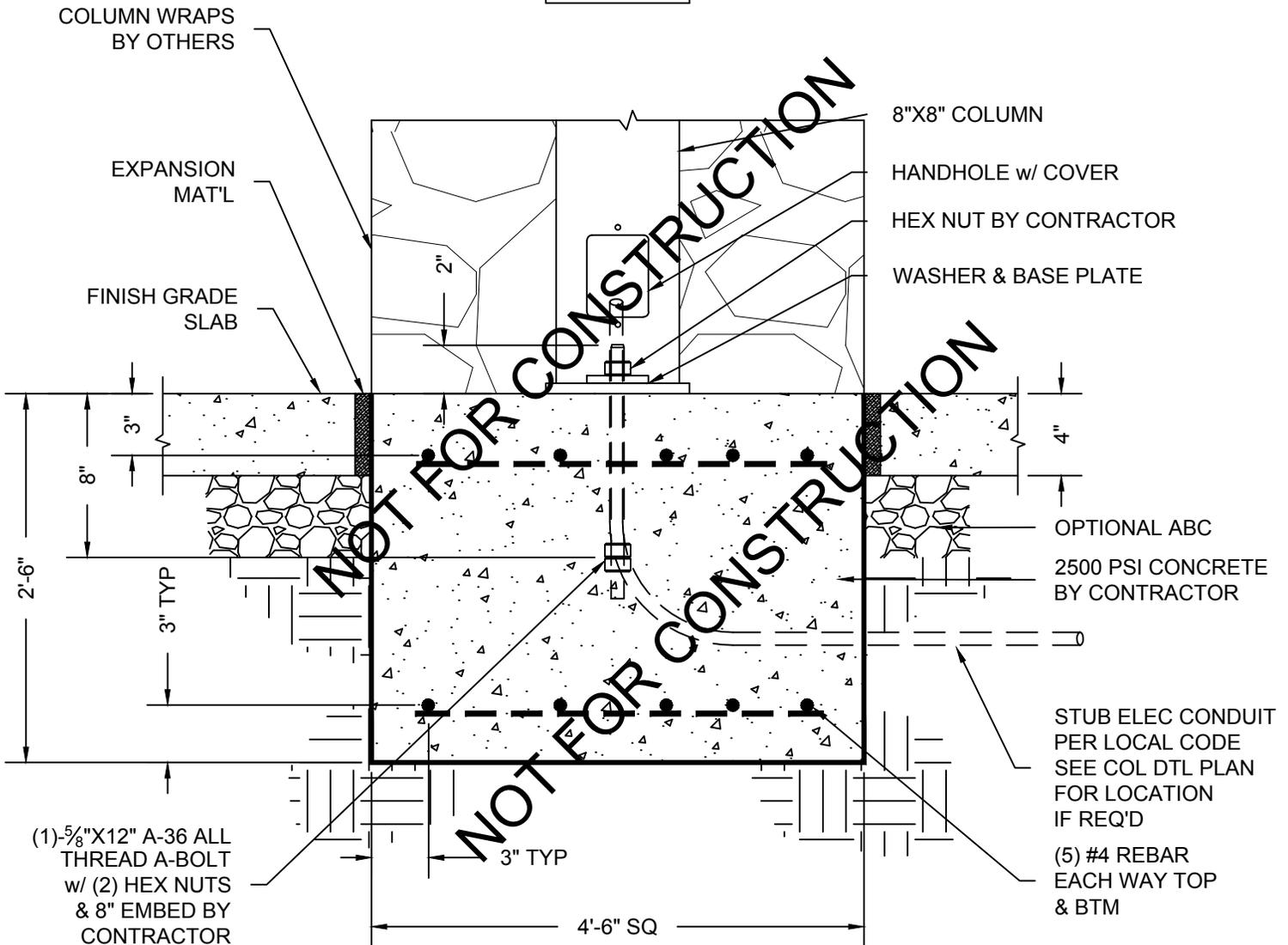
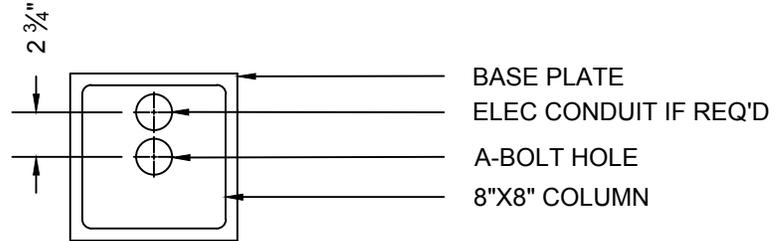


LAYOUT PLAN 35'X50' NORTHWEST MODEL  
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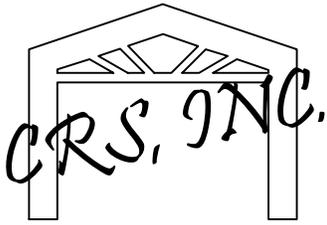
**NOTE: FOR ILLUSTRATION ONLY!  
FOOTING SIZE MAY CHANGE w/  
STRUCTURAL ENGINEERING**

**ADJUST FTG DEPTH FOR  
LOCAL FROST CONDITIONS**



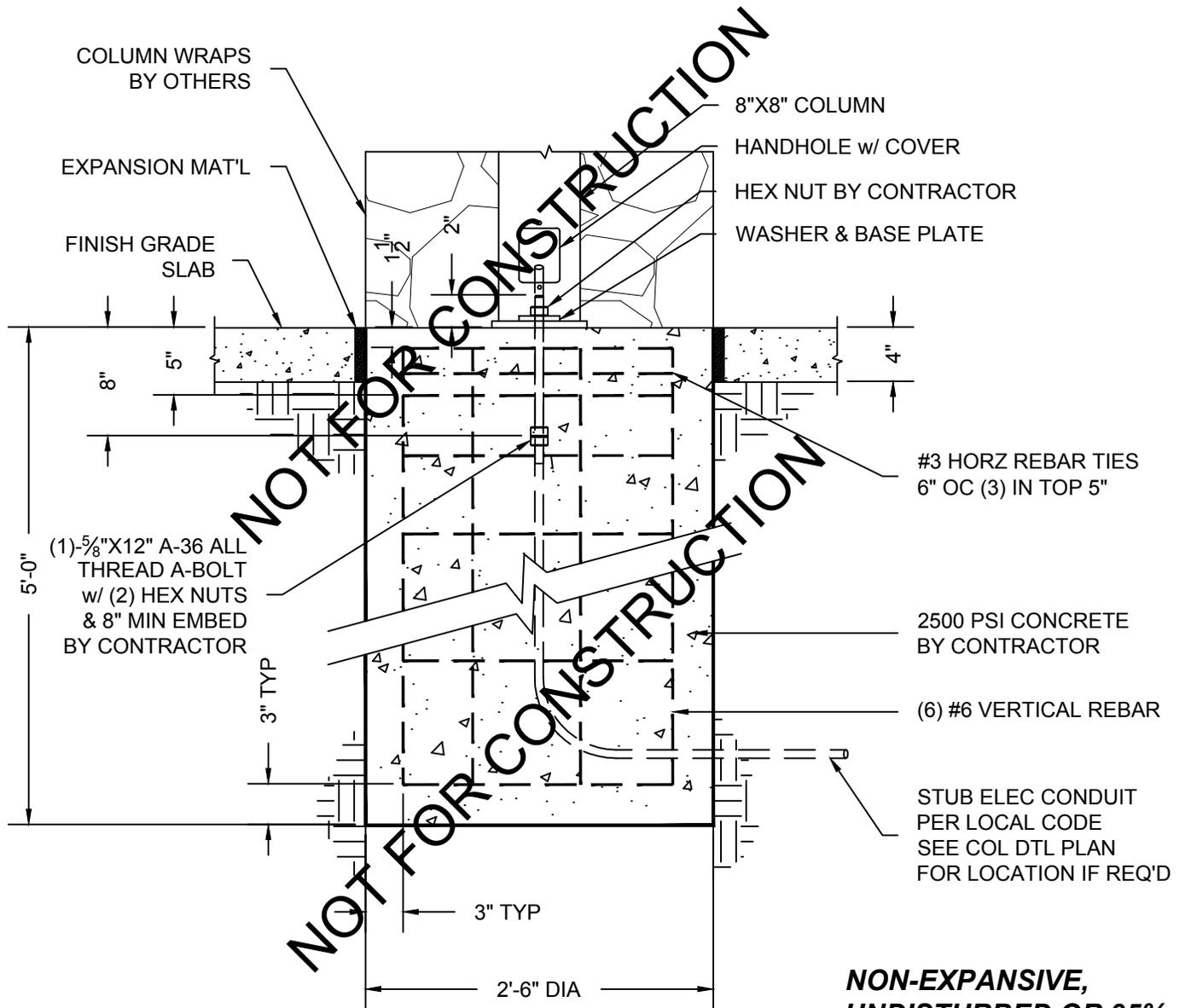
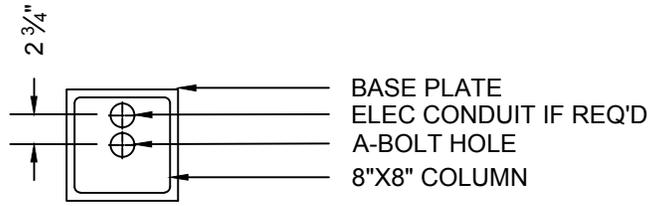
**NON-EXPANSIVE,  
UNDISTURBED OR 95%  
COMPACTED SUBGRADE**

**1-BOLT SURFACE MOUNT SPREAD FOOTING  
35'X50' NORTHWEST MODEL  
NTS**



**NOTE: FOR ILLUSTRATION ONLY!  
FOOTING SIZE MAY CHANGE w/  
STRUCTURAL ENGINEERING**

**ADJUST FTG DEPTH FOR  
LOCAL FROST CONDITIONS**



**NON-EXPANSIVE,  
UNDISTURBED OR 95%  
COMPACTED SUBGRADE**

**1-BOLT SURFACE MOUNT CAISSON FOOTING  
35'X50' NORTHWEST MODEL  
NTS**



GEOTECHNICAL ENGINEERING  
ENVIRONMENTAL CONSULTING  
CONSTRUCTION MATERIALS ENGINEERING AND TESTING

February 23, 2016

Mr. Mark H. Spencer  
**MHS Planning & Design, LLC**  
212 W. 9<sup>th</sup> Street  
Tyler, Texas 75701

**Re: Geotechnical Investigation  
The Green  
Keep Longview Beautiful  
City of Longview, Texas  
AGG Report No. LE16-005**

Dear Mr. Spencer:

Submitted herein is our geotechnical report for the project referenced above. This study was authorized by Mr. Mark H. Spencer with MHS Planning & Design, LLC on January 25, 2016. This investigation was delayed due to site access limitations to standard truck-mounted drilling equipment associated with soft, wet subgrade soil conditions. 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.**

A handwritten signature in blue ink that reads 'Terry W. Oswald'.

Terry W. Oswald, P.E.  
Vice President



2/23/16

TBPE Firm Registration  
Number 1970

Copies Submitted: (3)



**GEOTECHNICAL INVESTIGATION**

**THE GREEN**

**KEEP LONGVIEW BEAUTIFUL**

**CITY OF LONGVIEW, TEXAS**

**AGG REPORT NO. LE16-005**

**TO**

**MHS PLANNING & DESIGN, LLC**

**TYLER, TEXAS**

**BY**

**ALLIANCE GEOTECHNICAL GROUP, INC.**

**LONGVIEW, TEXAS**

**FEBRUARY 23, 2016**

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**GEOTECHNICAL INVESTIGATION  
THE GREEN  
KEEP LONGVIEW BEAUTIFUL  
CITY OF LONGVIEW, TEXAS**

**1. PROJECT DESCRIPTION**

The proposed project includes the construction of "The Green", an Eco-Friendly Event Venue, located along the northwest corner of Highway 31 and Highway 63 in the City of Longview, Texas. Specifically, the new park facilities is planned along the west side of Highway 63, north side of Highway 31, and bound by Grace Creek on the west. The new park facilities includes a Pavilion / Plaza; an Entrance Drive with food truck parking and a vehicle parking lot; a Pond / Wetlands; a Creek Overlook; and an 8-foot wide Concrete Trail. It is understood that the new Pavilion (canopy) will be supported by relatively shallow individual spread footings with a slab-on-grade concrete / brick floor slab. Site paving is planned to consist of reinforced Portland cement concrete pavement sections. Site grading requirements were not known at the time of this report. Likewise, the depth of the pond was not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). A general layout of the site is shown on 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 proposed improvements. Our scope of services included:

1. obtaining samples of the subsurface soil formations and making groundwater observations within the limits of three (3) exploratory borings for evaluation of general soil and groundwater conditions;
2. performing laboratory soil tests for soil classification of the subsurface soil strata;
3. providing recommendations for site paving and foundation support of the proposed structure including foundation type(s), depths, and allowable bearing capacity;
4. providing recommendations for slab-on-grade construction including stabilization techniques which may be used to minimize post-construction movement of the floor slabs and/or foundation elements;
5. providing recommendations for pavement subgrade preparation, including recommended dosage rates of stabilization additive and guideline specifications for subgrade stabilization, if applicable;
6. providing recommendations regarding the design and construction of the earthen pond, including guideline specifications for excavation and embankment / clay liner construction;

7. providing recommendations for compaction of earthwork including recommendations for suitable fill materials, placement, and compaction; and
8. discussion of potential construction problems.

### **3. FIELD INVESTIGATION**

Subsurface conditions were evaluated by a total of three (3) sample test borings drilled on February 8 and 11, 2016 within the limits of the proposed improvements. Specifically, two (2) sample test borings (Borings B-1 and B-3) were drilled on February 8, 2016 utilizing a standard truck-mounted drilling rig. However, due to site access limitations to truck-mounted drilling equipment, Boring B-2 was drilled on February 11, 2016 using hand drilling and sampling techniques. Boring locations were selected jointly by representatives of MHS Planning & Design, LLC and Alliance Geotechnical Group, Inc., and located in the field by representatives of Alliance Geotechnical Group, Inc. The approximate boring locations with respect to the proposed facilities are shown on the Plan of Borings, Figure 1.

Borings B-1 and B-3 were drilled to depths ranging from about 15 to 20 feet below existing grade to evaluate subsurface conditions. Boring B-2, drilled using hand drilling and sampling techniques, extended to a depth of about 5 feet below existing grade. Sample depth, soil description and classification (based on the Unified Soil Classification System) are shown on the Logs of Borings, Figures 2 through 4. A key to the descriptive terms and symbols used on the logs is presented on Figure 5.

The borings were typically 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 respective 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.

### **4. LABORATORY INVESTIGATION**

Upon return to the laboratory, representative specimens were selected for testing. The laboratory testing program was directed toward evaluation of 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 new park facility is located along the northwest corner of Highway 31 and Highway 63 in the City of Longview, Texas. Specifically, the new park facilities is planned along the west side of Highway 63, north side of Highway 31, and bound by Grace Creek on the west. The site is generally flat with surface vegetation consisting of native grasses and weeds. The site is located within a wetlands and therefore areas of ponding water and marsh grass are present throughout the site. Site grading requirements were not known at the time of this report. Likewise, the depth of the pond was not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). A general layout of the proposed facilities is shown on Figure 1.

### **5.2 Subsurface Conditions**

The site of the proposed improvements is located in an area underlain by Quaternary Alluvium (Flood-plain deposits), underlain by the Queen City Sand Formation, undivided, as indicated on the Tyler Sheet of the Geologic Atlas of Texas. Soil formations encountered at the site are shown in detail on the boring logs, Figures 2 through 4. The subsurface soil conditions are typical of alluvial deposits. These soils generally consist of non-plastic (PI=0) silty sand (SM), relatively low plasticity silty clayey sand (SC) and sandy clayey silt (CL-ML) strata, and relatively low to moderately plastic (CL) silty clay and silty sandy clay soils, both fill and natural. Note that the depth on the boring log refers to the depth from the existing grade or ground surface present at the time of the investigation. Boundaries between the various soil types are approximate, and the actual transition may be gradual.

Surficial, non-plastic (PI=0) brown silty fine sand (SM) "top soil" is present across the majority of the site to depths ranging from about 3 to 6 inches below existing grade at the boring locations.

Possible fill soils consisting of relatively low plasticity (CL) reddish brown, brown, and light gray silty sandy clay soils containing varying amounts of silty sand seams and pockets were encountered in Borings B-1 and B-3 to depths ranging from about 3 to 4 feet below existing grade at the boring locations. These silty sandy clay (possible) fill soils are considered soft to stiff in consistency at the present time, having Standard penetration test (SPT) blow counts ranging from about 3 to 13 blows per foot of penetration. These (possible) fill soils exhibited liquid limits ranging from about 27 to 32, plasticity indices (PI's) ranging from about 14 to 18, and contained about 51 to 53 percent fines (silt and clay passing the No. 200 sieve). In their present moisture content (moisture contents ranging from about 1 to 3 percentage points above (+1% to +3%) their respective plastic limits), these silty sandy clay (possible) fill soils are generally considered only slightly expansive with future increases in moisture.

Non-plastic (PI=0) silty fine sand (SM) and relatively low plasticity silty clayey sand (SC) and sandy clayey silt (CL-ML) strata were encountered at varying depths in Boring B-1 as

indicated on the boring log. These sandy and/or silty soil strata contained about 36 to 59 percent fines (silt and clay passing the No. 200 sieve) and are considered very loose to loose in relative density at the present time, having Standard penetration test (SPT) blow counts ranging from about 3 to 5 blows per foot of penetration. The silty clayey sand (SC) and sandy clayey silt (CL-ML) strata exhibited liquid limits ranging from about 19 to 33, and plasticity indices (PI's) ranging from about 6 to 20.

Relatively low to moderately plastic (CL) silty clay and silty sandy clay soils were predominant in the sample test borings. These silty clay and/or silty sandy clay soils are considered soft to stiff in consistency at the present time, having Standard penetration test (SPT) blow counts ranging from about 5 to 15 blows per foot of penetration. These silty clay and/or silty sandy clay soils exhibited liquid limits ranging from about 25 to 41, plasticity indices (PI's) ranging from about 9 to 28, and contained about 52 to 81 percent fines (silt and clay passing the No. 200 sieve). In their present moisture content (moisture contents ranging from about 0 to 7 percentage points above (+0% to +7%) their respective plastic limits), these silty sandy clay (possible) fill soils are generally considered only slightly to moderately expansive with future increases in moisture.

### **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 18.5 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 16 feet below existing grade in Boring B-1 as indicated on the boring log. Borings B-2 and B-3 were dry and generally open to their 5 to 15 feet respective drilled depths upon completion of the drilling operations. It should be recognized that groundwater levels will fluctuate with variations in seasonal precipitation, surficial runoff, and water levels within Grace Creek. If construction occurs during or following periods of heavy rainfall, shallow groundwater should be anticipated in the form of seepage within the granular soil layers and through the cracks, fissures, and fractures within the overburden clay 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.

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

The recommendations given in this report were prepared exclusively for MHS Planning & Design, LLC, Keep Longview Beautiful, 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 Support of Structural Loads – Relatively Shallow Spread Footings**

It is understood that the new Pavilion (canopy) will be supported by relatively shallow individual spread footings with a slab-on-grade concrete / brick slab. The results of the field and laboratory tests show the presence of relatively soft and/or loose subsurface soils. Site grading requirements were not known at the time of this report. However, based on visual

observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site).

Due to the presence of relatively deep, soft to stiff clayey soil strata and/or very loose to loose sandy soils; and the potential for relatively shallow groundwater levels associated with construction within the flood plain, an appropriate dewatering system will likely be required to dewater these soils prior to and during construction. If construction is performed during the summer months, it is possible that dewatering may not be required. This is discussed in greater detail in the following section.

In order to limit excessive foundation settlements, it is recommended that the subgrade soils at the base of the footing excavations be excavated and reworked in (moisture and density controlled) compacted lifts to depths of at least two (2) feet below the bottom of the footings. In addition, in order to limit excessive foundation settlements, it is recommended that the spread footings be constructed on minimum 4-inch thick lean concrete mud slabs. The purpose of the lean concrete mud slabs will be to provide a stable working platform and to prevent desiccation (and disturbance) of the underlying subgrade soils during construction and to inhibit moisture penetration beneath the foundation after construction. The lean concrete mud slabs shall have a minimum 28-day compressive strength of 2,000 pounds per square inch (psi) and should be poured within 24 hours after satisfactory compaction of the underlying soils at the base of the foundation excavations. If the sandy soils are dry, firm and stable, and concrete placement operations (construction of the individual spread footings) are performed within 24 hours after satisfactory compaction of the underlying soils at the base of the foundation excavations, the lean concrete mud slabs may be omitted.

Groundwater and surface rain water has the potential of entering the non-plastic (PI=0) to low plasticity sandy subgrade soils and cause a "pumping" condition. The contractor shall grade the base of the excavations to prevent ponding within the zone of influence of the base of the foundations (within a 1(H):1(V) slope extending below the edge of the foundation). If these sandy soils become wet and "pump", overexcavation, aeration, and reworked in (moisture and density controlled) compacted lifts will be required to limit post-construction settlement caused by soft subgrade soils. Excavation should extend until relatively firm soils are exposed.

Due to the presence of relatively soft silty sandy clay (possible) fill soils underlain by loose, non-plastic (PI=0) silty fine sand (SM), it is recommended that all individual spread footings be constructed at depths between two (2) and five (5) feet below existing grade. Isolated (individual) spread footings constructed at depths between two (2) and five (5) feet below existing grade may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot (psf). **The maximum allowable bearing capacity indicated above assumes proper dewatering is provided, and subgrade preparation and placement of concrete mud slabs is performed as outlined below.**

All footings not subjected to lateral and/or eccentric loading should possess sufficient rigidity to impose a uniform contact pressure on the substrata. It should be noted that footings

subjected to lateral and/or eccentric loading will not impose a uniform contact bearing pressure on the substrata. The maximum allowable bearing capacity indicated above shall not be exceeded at any point under the footing. This (net) allowable bearing capacity assumes foundation settlements of about 1.0 inch or less. Settlements can be reduced by widening the footings and reducing the actual bearing pressure beneath the footings. Actual settlements will vary linearly with bearing pressure. If the above recommended bearing pressure is reduced by 50%, settlements should be on the order of one-half inch. These values assume that the subgrade is prepared in strict accordance with the recommendations outlined below.

If the footings must be designed for lateral resistance, they should be concreted for their full depth to assure direct contact with the undisturbed adjacent soils. Likewise, forms shall not be allowed for forming the sides of the concrete footings. Alternately, if site conditions require larger excavations to access the base of the footings to perform the required excavation and reworking of the subgrade soils at the base of the footing excavations as outlined below, then forms may be used to form the sides of the concrete footings. If forms are used to form the side of the concrete footings, all backfill placed adjacent to the footings shall be compacted to within the limits indicated below (based on the plasticity index (PI) of the backfill soils). The footings may be designed for an allowable passive (lateral) resistance of 200 psf per foot of footing depth. A friction factor of 0.35 may be used to resist sliding. If additional sliding resistance is needed, a keyway should be installed below the footing and designed for an allowable passive (lateral) resistance of 250 psf per foot of keyway depth (below the footing).

**All footing excavations, subgrade preparation, and footing installations should be inspected by an experienced Alliance Geotechnical Group, Inc. geotechnical engineer or engineering technician (under the direction of the geotechnical engineer) to verify that the footings are installed at the proper depth, in firm compact soils, and that the footing excavations are clean, properly sized, and dry prior to concrete placement.**

#### **6.1.1 Dewatering**

Shallow groundwater was not encountered during the drilling operations as indicated on the boring logs. At the time of this investigation, groundwater seepage was encountered during the drilling operations in Boring B-1, at a depth of about 18.5 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 16 feet below existing grade in Boring B-1 as indicated on the boring log. However, due to the presence of relatively deep, soft to stiff clayey soil strata and/or very loose to loose sandy soils and the potential for relatively shallow groundwater levels associated with construction within the flood plain, it should be anticipated that shallow groundwater seepage will likely be encountered during excavations at this site, particularly if construction occurs during or following heavy rains. Therefore, an appropriate dewatering system will likely be required to dewater these soils prior to excavation and during construction of the relatively shallow spread footings. If construction is performed during the summer months, it is possible that dewatering may not be required.

It may not be possible to intercept all groundwater flow by means of a single stage dewatering system. A secondary system of collection ditches, sumps and pumping may also be required to provide groundwater control. It will also be necessary to control surface water. The design of an appropriate dewatering system is the responsibility of the General

Contractor. Groundwater levels should be lowered at least three (3) feet below the excavation bottoms and maintained at that level during construction, until backfilling is completed. If proper groundwater control is not provided as detailed herein, the excavation bottoms could become excessively softened resulting in differential settlements. If construction is performed during the summer months, it is possible that dewatering may not be required.

### **6.1.2 Shallow Spread Footing and Building Pad Preparation**

Site grading requirements were not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site).

Due to the presence of relatively deep, soft to stiff clayey soil strata and/or very loose to loose sandy soils, excavation and reworking of the surficial soils in (moisture and density controlled) compacted lifts will be required to limit differential foundation movements. Specifically, in order to limit differential foundation movements, excavation and reworking of the surficial soils in (moisture and density controlled) compacted lifts should be performed to minimum depths of two (2) feet below existing grade or final pad grade, whichever is deeper, and/or at least two (2) feet below the bottom of the individual spread footings, as outlined below. In addition, if the sandy soils at the base of the excavation become wet and “pump”, overexcavation, aeration, and reworked in (moisture and density controlled) compacted lifts will be required to limit post-construction settlement caused by soft subgrade soils. Excavation should extend until relatively firm soils are exposed. In addition, in order to limit excessive foundation settlements, it is recommended that the spread footings be constructed on minimum 4-inch thick lean concrete mud slabs. The purpose of the lean concrete mud slabs will be to provide a stable working platform and to prevent desiccation (and disturbance) of the underlying subgrade soils during construction and to inhibit moisture penetration beneath the foundation after construction. The lean concrete mud slabs shall have a minimum 28-day compressive strength of 2,000 pounds per square inch (psi) and should be poured within 24 hours after satisfactory compaction of the underlying soils at the base of the foundation excavations. If the sandy soils are dry, firm and stable, and concrete placement operations (construction of the individual spread footings) are performed within 24 hours after satisfactory compaction of the underlying soils at the base of the foundation excavations, the lean concrete mud slabs may be omitted

The subgrade shall be prepared in accordance with the procedures outlined below. Clearing, grubbing and stripping of brush, organic topsoil and unsuitable materials shall also be accomplished in accordance with the procedures outlined below.

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 present, 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 4, below. 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 construction pad and fill areas.

2. **Excavate to a minimum depth of two (2) feet below existing grade or final pad grade, whichever is deeper, and/or at least two (2) feet below the bottom of the individual spread footings.** The footing excavations shall extend a minimum of three (3) feet beyond the edge of the spread footings. The building pad excavation shall extend a minimum of five (5) feet beyond proposed building lines. The excavation and subsequent fill placement shall transition (taper) from the bottom of the excavation (minimum 5 feet beyond proposed building limits) to the ground surface beyond the building area, along at least a 1(H):1(V) slope. The bottom of the excavation shall be placed on a 1% slope so any water that may collect does not pond (excessively) within the building foot print.
3. The subgrade soils at the base of the building pad excavation shall be proofrolled prior to fill placement to detect any areas of weakness. 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. As a minimum, the subgrade soils should be proofrolled using a fully loaded dump truck to detect any areas of weakness. The proofrolling operations should be observed by an experienced Alliance Geotechnical Group, Inc. geotechnical engineer or geotechnician. Any soft or compressible areas detected by Alliance Geotechnical Group, Inc. field personnel during proofrolling shall be undercut until firm material is exposed. Low areas resulting from undercutting shall be filled in compacted lifts in accordance with Item 4, below. It cannot be overemphasized that the proofrolling is imperative to assure that a firm subgrade is present prior to fill placement. It is also imperative that a firm subgrade be provided and maintained during construction.

The subgrade soils at the base of the footing excavations shall be probed prior to fill placement to detect any areas of weakness. Probing should be made by an experienced Alliance Geotechnical Group, Inc. engineer or geotechnician (under the direction of an experienced engineer) to detect any areas of weakness and verify required bearing capacity. Any soft or compressible areas detected by Alliance Geotechnical Group, Inc. field personnel during the probing operations shall be undercut until firm material is exposed. Low areas resulting from undercutting shall be filled in compacted lifts in accordance with Item 4, below. It cannot be overemphasized that the probings are imperative to assure that a firm subgrade is present prior to concrete placement.

4. After proofrolling and/or probings have been completed, as indicated above in Item 3, the upper six (6) to eight (8) inches of subgrade soils at the base of the excavations should be recompacted to within the moisture content and density 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 D698 (standard Proctor), at a moisture content within three percentage points ( $\pm 3\%$ ) of the optimum moisture value. Clayey 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 D698 (standard Proctor), at a moisture content ranging from one percentage point below to five percentage points above the optimum moisture value (-1% to +5%). 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 D698 (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>
<u>_ 15</u>	<u>+3%</u>	95% +
16 to 25	-1% to +5%	95% +
<u>≥ 26</u>	+1% to +6%	95% to 100%

\* Percent of the maximum density defined by ASTM D698 (standard Proctor).

5. If the sandy subgrade soils at the base of the excavations are allowed to become wet and “pump”, overexcavation, aeration, and reworking of the subgrade soils in (moisture and density controlled) compacted lifts will be required to limit post-construction settlement caused by soft subgrade soils. Excavation should extend until firm soils are exposed. All fill soils shall be placed in maximum eight (8) inch lifts and compacted as outlined above, Item 4.
6. In the building pad, fill to final pad grade using on-site excavated subgrade soils, reworked in (moisture and density controlled) compacted lifts.

In the footing excavations, fill to an elevation corresponding to at least four (4) inches below the bottom of the individual spread footings on-site excavated subgrade soils, reworked in (moisture and density controlled) compacted lifts.

All fill soils 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 4. The first lift of fill shall be placed and compacted within 48 hours of satisfactory compaction of the underlying soils at the base of the excavation. Likewise, subsequent lifts of fill shall be placed and compacted within 48 hours of satisfactory compaction of the previous lift of fill.

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.

7. Conduct in-place (nuclear) density tests (ASTM D6938) at the rate of at least one (1) test per 200 square feet of surface area for each lift or a minimum of three (3) tests per construction area for each lift of material, whichever is greater.
8. The moisture content within the completed pad shall be maintained until the slab is constructed. Water should not be allowed to pond in any beam excavation. Prior to concrete placement, it should be verified that all beams are founded in firm, compact soils.
9. The utility plan should be reviewed to verify that no utility line excavations extend within the zone of influence of any footing (within a 1(H):1(V) slope extending below the edge of the footing). Utility service line excavations extending beneath and/or perpendicular to any footing should be backfilled and compacted in accordance with Item 4, above.
10. A minimum 4-inch thick concrete mud slab shall be placed above the compacted subgrade soils within the individual spread footing excavations. This lean concrete mud slab should have a minimum 28-day compressive strength of 2,000 psi and should extend a minimum of one (1) foot beyond the edge of the individual spread footings. The concrete mud slab shall be placed within 24 hours after satisfactory compaction of the subgrade is achieved. If concrete placement operations (construction of the individual spread footings) are performed within 24 hours after satisfactory compaction of the underlying soils at the base of the foundation excavations, the concrete mud slabs may be omitted.
11. Backfill above the spread footings shall consist of on-site excavated subgrade soils, reworked in (moisture and density controlled) compacted lifts. All backfill shall be placed in maximum eight (8) inch lifts and compacted to within the limits indicated above, Item 4. Compaction above the spread footings shall be achieved using hand compaction equipment.

### **6.1.3 Floor Slab Used in Conjunction with Shallow Spread Footings**

Site preparation and select fill placement in strict accordance with the recommendations provided herein should permit the use of slab-on-grade floor slabs. Soil possessing excessive plasticity shall be excluded from placement in the fill zone. **Box outs or similar techniques should be provided to separate the slab-on-grade floor slab from the foundation system (shallow spread footings).**

Specifications for subgrade preparation are provided above in Section 6.1.2, Shallow Spread Footing and Building Pad Preparation. All fill placed within the building area shall be placed and verified in accordance with these specifications.

A suitable polyethylene moisture (vapor) barrier should be provided beneath all ground supported slabs. The polyethylene sheeting should be overlapped a minimum of 6 inches and properly sealed to provide airtight joints. In addition, all penetrations and/or repair splices should be properly sealed to provide airtight joints. Penetrations (punch holes) of the polyethylene sheeting to reduce bleedwater rise during construction and allow the slab to set quicker should be strictly prohibited. It is recommended that minimum 6-mil thick polyethylene sheets be used. Thicker polyethylene sheets may be used to resist puncturing. Procedures for installation of polyethylene moisture (vapor) barriers are

provided in the current edition of the American Concrete Institute's (ACI) Committee 302, Guide for Concrete and Floor Slab Construction.

#### 6.1.4 Seismic Site Classification

Based on the average standard penetration resistance within the drilled depth of the boring, it is our opinion that this site would be classified as Class D, based on the 2012 International Building Code.

In accordance with Section 1613, Earthquake Loads, of the 2012 International Building Code, and utilizing the United States Geologic Survey (USGS) web site, Earthquake Hazards Program, U.S. Seismic Design Maps, the following parameters are recommended by the IBC Code. Print outs of these Design Maps and Detailed Reports are included in the Appendix of this report.

Mapped Acceleration Parameters:  $S_S = 0.117 \text{ g}$   
 $S_1 = 0.063 \text{ g}$

Site Coefficients:  $F_a = 1.6$   
 $F_v = 2.4$

Maximum Earthquake Spectral Response Acceleration Parameters:  $S_{MS} = 0.187 \text{ g}$   
 $S_{M1} = 0.151 \text{ g}$

Design Spectral Response Acceleration Parameters:  $S_{DS} = 0.125 \text{ g}$   
 $S_{D1} = 0.101 \text{ g}$

#### 6.1.5 Pipe Connections and Bedding

Pipe connections to the structures should consider the potential for post construction differential ground movements. If rigid pipe connections are used, additional bedding may be required beneath the pipe. Flexible joints or tapered bedding depths could be used to accommodate future differential movement.

Backfill for utility lines should be carefully placed so they will be stable. The backfill should be placed in maximum eight (8) inch lifts and compacted as outlined below based on the plasticity index (PI) of the respective fill soils. Where utility lines pass through pavement areas, the upper 6 to 8 inches should be prepared and compacted similarly to the remainder of pavement subgrade.

<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 +5%	95% +
$\geq 26$	+1% to +6%	95% to 100%

\* Percent of the maximum density defined by ASTM D698 (standard Proctor).

## 6.2 Pavement Recommendations

It is understood that site paving for the new facilities is planned to consist of reinforced Portland cement concrete paving. Site grading requirements were not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new pavement construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). Therefore, after clearing and stockpiling the non-plastic silty sand (SM) "top soil", exposed subgrade soils are anticipated to consist of relatively low to moderately plastic (CL) silty sandy 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. Since rigid (Portland cement concrete) pavement sections are planned for this project, cement treatment of the relatively low to moderately plastic (CL) silty sandy clay subgrade soils may be considered to provide a firm, stable subgrade soil condition for new pavement construction and to minimize piping beneath the pavement sections after construction.

Due to the potential for variable subgrade soil conditions at this site, depending on the grading requirements, a minimum of four percent (4%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 15 or less. Alternately, a minimum of six percent (6%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 16 or more. During construction, the subgrade soils shall be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to evaluate the subgrade soils at final pavement subgrade elevation and field delineate, if appropriate, areas where four percent (4%) Type I, Type II, or Type I/II Portland cement may be used and areas where six percent (6%) Type I, Type II, or Type I/II Portland cement is required to treat the subgrade soils. For bidding purposes, it is recommended that project documents include six percent (6%) Type I, Type II, or Type I/II Portland cement beneath all site paving.

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 subgrade treatment operations. The recommended pavement sections indicated below are based on the assumption that a firm subgrade, having adequate moisture content and density, be provided and maintained during construction and that the subgrade soils are treated as outlined below.

### 6.2.1 Pavement Sections

The subgrade soils should be prepared in accordance with the recommendations outlined in Section 6.2.2, Pavement Subgrade Preparation. 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 subgrade treatment operations. The recommended pavement sections indicated below are based on the assumption that a firm subgrade, having adequate moisture content and density, be provided and maintained during construction and that the subgrade soils are treated as outlined below.

Listed below are the recommended pavement sections for this project. Adequate subgrade preparation, stabilization and drainage is essential to pavement performance in accordance with design criteria.

**Reinforced Portland Cement Concrete Pavement Sections:**

<b>Pavement Course</b>	<b>Pavement Component</b>	<b>Regular Duty <sup>(1)</sup></b>	<b>Medium Duty <sup>(2)</sup></b>	<b>Heavy Duty <sup>(3)</sup></b>
Surface Course	Reinforced 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. 3 bars on 18 inch spacings (or No. 4 bars on 24 inch spacings) for Regular Duty Pavement Sections and/or No. 4 bars on 18 inch spacings for Medium and Heavy Duty Pavement Sections, center to center, each way (maximum 15-foot joint spacing). All coarse aggregate <u>shall</u> consist of <u>crushed</u> stone.	5.0"	6.0"	8.0"
Subgrade	Cement Treated Subgrade, TxDOT Item 275 (2014 Edition), 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%).  <u>NOTE:</u> A minimum of 4% Type I, Type II, or Type I/II Portland cement by dry weight (minimum 30 pounds per square yard) shall be used to treat subgrade soils having a plasticity index (PI) of 15 or less. A minimum 6% Type I, Type II, or Type I/II Portland cement by dry weight (minimum 42 pounds per square yard) shall be used to treat subgrade soils having a plasticity index (PI) of 16 or greater.	8.0"	8.0"	8.0"

(1) Regular Duty Pavement Sections (Auto Parking)

(2) Medium Duty Pavement Sections (Auto Drives / Food Truck Parking)

(3) Heavy Duty Pavement Sections (Heavy Truck Drives) – Includes Dumpster Pad Areas and/or Heavy Truck Loading / Unloading Areas, if applicable.

Concrete compressive strength should be at least 3,200 psi at 7 days, and/or 4,000 psi at 28 days, in accordance with TxDOT Specifications. Maximum joint spacings should be 15 feet center to center (12 foot centers are preferable). Careful attention should be given to subgrade preparation, subgrade stabilization and drainage since pavement performance is highly dependent on proper subgrade support and drainage. Guideline specifications for the installation of pavement subgrade, subgrade treatment, and reinforced Portland cement concrete pavement are provided in the following sections.

### **6.2.2 Pavement Subgrade Preparation**

Site grading requirements were not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new pavement construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). Therefore, after clearing and stockpiling the non-plastic (PI=0) silty sand (SM) "top soil", exposed subgrade soils are anticipated to consist of relatively low to moderately plastic (CL) silty sandy 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. Since rigid (Portland cement concrete) pavement sections are planned for this project, cement treatment of the relatively low to moderately plastic (CL) silty sandy clay subgrade soils may be considered to provide a firm, stable subgrade soil condition for new pavement construction and to minimize piping beneath the pavement section after construction.

Due to the potential for variable subgrade soil conditions at this site, depending on the grading requirements, a minimum of four percent (4%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 15 or less. Alternately, a minimum of six percent (6%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 16 or greater. During construction, the subgrade soils shall be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to evaluate the subgrade soils at final pavement subgrade elevation and field delineate, if appropriate, areas where four percent (4%) Type I, Type II, or Type I/II Portland cement may be used and areas where six percent (6%) Type I, Type II, or Type I/II Portland cement is required to treat the subgrade soils. For bidding purposes, it is recommended that project documents include six percent (6%) Type I, Type II, or Type I/II Portland cement beneath all site paving.

Surface drainage is critical to the performance of this pavement. Water should be allowed to exit the pavement surface quickly. This can be accomplished by maintaining at least 1% 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 three (3) feet below existing grade prior to fill placement or three (3) 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. 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.

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 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. As a minimum, the subgrade soils should be proofrolled using a fully loaded dump truck to detect any areas of weakness. The proofrolling operations should be observed by an experienced Alliance Geotechnical Group, Inc. engineer or geotechnician. Any soft, loose, compressible, and/or unstable areas detected by Alliance Geotechnical Group, Inc. field personnel 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 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 D698 (standard Proctor) at a moisture content within three percentage points ( $\pm 3\%$ ) of optimum moisture. 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 D698 (standard Proctor) at a moisture content ranging from one percentage point below to five percentage points above the optimum moisture value (-1% to +5%). 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 D698 (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. Overcompaction shall not be allowed.

<u>Plasticity Index (PI)</u>	<u>Moisture Content Range at Time of Compaction (%)</u>	<u>Percent Maximum Dry Density (%) *</u>
≤ 15	+3%	95% +
16 to 25	-1% to +5%	95% +
≥ 26	+1% to +6%	95% to 100%

\* Percent of the maximum density defined by ASTM D698 (standard Proctor).

- Where fill is required to achieve the desired grades, such material shall consist of on-site soils. 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.

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.

- The upper eight (8) inches of the subgrade in all pavement areas should be treated using Type I, Type II or Type I/II Portland cement 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, and as outlined below in Section 6.2.3, Pavement Subgrade Treatment, and associated subsections.

A minimum of four percent (4%) Type I, Type II or Type I/II Portland cement (minimum 30 pounds per square yard for an eight (8) inch treatment depth) should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 15 or less, as outlined below in Section 6.2.3, Pavement Subgrade Treatment, and corresponding subsection.

A minimum of six percent (6%) Type I, Type II or Type I/II Portland cement (minimum 42 pounds per square yard for an eight (8) inch treatment depth) should be used to treat sandy clay subgrade soils having a plasticity index (PI) of 16 or more, as outlined below in Section 6.2.3, Pavement Subgrade Treatment, and corresponding subsection.

It should be noted that additional mixing may be required where 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.

6. 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 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.

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 untreated and treated subgrade soils.

7. 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.
8. 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, or until the concrete pavement has been poured.

### **6.2.3 Pavement Subgrade Treatment**

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. Since rigid (Portland cement concrete) pavement sections are planned for this project, cement treatment of the relatively low to moderately plastic (CL) silty sandy clay subgrade soils may be considered to provide a firm, stable subgrade soil condition for new pavement construction and to minimize piping beneath the pavement section after construction.

Due to the potential for variable subgrade soil conditions at this site, depending on the grading requirements, a minimum of four percent (4%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 15 or less. Alternately, a minimum of six percent (6%) Type I, Type II, or Type I/II Portland cement should be used to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 16 or more. During construction, the subgrade soils shall be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to evaluate the subgrade soils at final pavement subgrade elevation and field delineate, if appropriate, areas where four percent (4%) Type I, Type II, or Type I/II Portland cement may be used and areas where six percent (6%) Type I, Type II, or Type I/II Portland cement is required to treat the subgrade soils. For bidding purposes, it is recommended that project documents include six percent (6%) Type I, Type II, or Type I/II Portland cement beneath all site paving.

It should be recognized that additional mixing may be required where 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 Texas Department of Transportation (TxDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014 Edition.

Where possible, it would be beneficial to treat the subgrade soils at least three (3) feet beyond the pavement edges (five (5) feet is preferred). These extended limits should aid in reducing pavement movements and cracking along the pavement edges due to seasonal moisture variations after construction.

### 6.2.3.1 Cement Treatment of Sandy Subgrade Soils

Cement treatment of sandy subgrade soils 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.

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 to treat sandy and/or silty subgrade soils having a plasticity index (PI) of 15 or less. A minimum of six percent (6%) Type I, Type II or Type I/II Portland cement should be used to treat sandy clay subgrade soils having a plasticity index (PI) of 16 or more.

The required application rate for a four percent (4%) and six percent (6%) treatment depth of eight (8) inches is outlined below based on the plasticity index (PI) of the predominant subgrade soils.

Plasticity Index (PI)	Application (percent)	Depth of Treatment (inches)	Type I, II, I/II Portland Cement Required (pounds/square yard)*
< 15	4	8	30
≥ 16	6	8	42

\* The recommended cement quantities have been adjusted to compensate for construction tolerances (non-uniformity) associated with cement spreading and rotary mixing. It should be recognized that subgrade soils having a plasticity index (PI) in excess of 15 may require additional mixing 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.

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 cement treatment), since these more porous soils can allow water inflow, resulting in strength loss of subgrade soils. It should be specified that only cement 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 cement 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, until application of the prime coat has been completed, if applicable, or until the concrete pavement has been poured.

## **6.2.4 Guidelines for Concrete Paving**

### **6.2.4.1 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).

### **6.2.4.2 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-fourth of the slab thickness. 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 should 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.

### **6.3 Pond Excavation and Construction**

Site grading requirements were not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). Therefore, subgrade soils in the vicinity of the Pond (Boring B-3) are anticipated to consist of relatively low to moderately plastic (CL) silty clay and silty sandy clay soils, both fill and natural, underlain by low plasticity silty clayey sand (SC).

The depth of the bottom of the pond was not known at the time of this report. Based on the results of typical classification testing (Atterberg Limits and percent fines passing the No. 200 sieve), it is believed that the on-site relatively low to moderately plastic (CL) silty clay and silty sandy clay soils encountered to a depth of about 8 feet below existing grade at Boring B-3 should provide reasonable permeability against subsurface seepage. However, due to the variable nature of these alluvial soils (relatively low to moderately plastic (CL) silty sandy clay soils containing silty very fine sand to silt seams and layers), proper reworking will be required. It is believed that proper reworking (using a pulverizing mixer) and compaction of these soils will result in a hydraulic conductivity (coefficient of permeability) of less than about  $1 \times 10^{-5}$  cm/sec. Based on the results of the laboratory classifications testing (Atterberg Limits and percent fines passing the No. 200 sieve), the subsurface soils encountered at this site are not typically considered suitable soils for use as "clay liner" material. Due to the presence of relatively low to moderately plastic (CL) silty sandy clay soils containing silty very fine sand to silt seams and layers, a minimum two (2) feet thick properly reworked (using a pulverizing mixer) and compacted sections should be considered for this project. It is believed that proper reworking (using a pulverizing mixer) and compaction of these soils in properly benched, horizontal lifts will result in a hydraulic conductivity (coefficient of permeability) of less than about  $1 \times 10^{-5}$  cm/sec.

#### **6.3.1 Pond Sideslopes and Erosion Considerations**

Pond sideslopes of 2(H):1(V) are generally considered to be stable with respect to deep seated slides. However, shallow skin slides may occur even if flatter slopes are used due to the development of desiccation (shrinkage) cracks in the clay soils during dry summer and fall months followed by heavy rains in the winter and spring. In order to reduce future maintenance associated with the repair of these shallow skin slides, slope ratios of 4(H):1(V) should be considered above the design water level (low stage). Flatter sideslopes

would be preferred above the design water level, if possible, to minimize future maintenance associated with the repair of these shallow skin slides. However, shallow skin slides have been observed along slopes as flat as 7(H):1(V) where highly plastic surficial CH clay soils are exposed along the slopes. Likewise, flatter sideslopes (minimum 4(H):1(V)) are preferred for maintenance (mowing) purposes.

A vegetative cover and irrigation system will also minimize shallow skin slides on slopes above the groundwater level by reducing the magnitude and depth of seasonal desiccation cracks. Areas near and above operating water level and at points of concentrated surface flow into the reservoir should be protected against erosion.

### **6.3.2 Pond Excavation Dewatering**

Shallow groundwater was not encountered during the drilling operations as indicated on the boring logs. At the time of this investigation, groundwater seepage was encountered during the drilling operations in Boring B-1, at a depth of about 18.5 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 16 feet below existing grade in Boring B-1 as indicated on the boring log. Borings B-2 and B-3 were dry and generally open to their 5 to 15 feet respective drilled depths upon completion of the drilling operations. However, due to the presence of relatively deep, soft to stiff clayey soil strata and/or very loose to loose sandy soils and the potential for relatively shallow groundwater levels associated with construction within the flood plain, it should be anticipated that shallow groundwater seepage will likely be encountered during excavations at this site, particularly if construction occurs during or following heavy rains. In areas where groundwater seepage is encountered, a system of collection ditches, sumps and pumping will likely be required to provide groundwater control. In order to provide dry working conditions for earthwork construction, it will also be necessary to control surface water. The design of an appropriate dewatering system is the responsibility of the General Contractor. Groundwater levels should be lowered to below the excavation bottoms and maintained at that level during construction, until backfilling is completed. If construction is performed during the summer months, it is possible that dewatering may not be required.

Surface drainage should be established at the start of construction and maintained during and after construction to minimize surface water infiltration and erosion. Consideration should also be given regarding an appropriate method for discharging the groundwater during dewatering operations (outside the limits of influence related to groundwater recharge).

### **6.3.3 Hydrostatic Blowout Considerations**

It should be recognized that in order to prevent blowout of properly reworking soils along the sideslopes and bottom of the pond during and after construction, dewatering operations must be performed properly and effectively. Dewatering must be maintained until construction is completed and the pond is filled to elevations above the existing groundwater level.

Likewise, after construction, the water level within the pond should not be allowed to drop below the adjacent groundwater level. It would therefore be advisable to install permanent groundwater monitoring wells around the pond prior to construction to allow accurate determinations of the groundwater elevation adjacent to the pond and to monitor

fluctuations in groundwater levels after construction. If the water levels in the pond drop below the adjacent groundwater level (during drought conditions, to allow for maintenance, etc.), the reworked sections could be ruptured due to hydrostatic uplift.

It would be preferred that the pond not be drained after construction. However, if it is required that the pond be drained for maintenance purposes, the pond should be drained very slowly to prevent instability due to rapid draw down effects. The pond should be drained at one (1) foot increments. Further lowering of the water level within the pond should not be allowed until it is verified that adjacent groundwater levels have stabilized and that seepage is not occurring along the sideslopes.

#### **6.3.4 Guideline Specifications for Pond Excavation and Liner Construction**

Site grading requirements were not known at the time of this report. However, based on visual observations of existing site topography and discussions with the client, it is assumed that minimal site grading (cuts and fills of less than about one (1) to two (2) feet) will be required to achieve final grades throughout the majority of the site. Isolated areas may require additional site grading to facilitate surface water drainage improvements and new construction. Since this site is located within a wetlands, it is our understanding that all site grading will be balanced on-site (i.e., no soils will be removed from this site and/or no fill soils will be brought onto this site). Therefore, subgrade soils in the vicinity of the Pond (Boring B-3) are anticipated to consist of relatively low to moderately plastic (CL) silty clay and silty sandy clay soils, both fill and natural, underlain by low plasticity silty clayey sand (SC).

The depth of the bottom of the pond was not known at the time of this report. Based on the results of typical classification testing (Atterberg Limits and percent fines passing the No. 200 sieve), it is believed that the on-site relatively low to moderately plastic (CL) silty clay and silty sandy clay soils encountered to a depth of about 8 feet below existing grade at Boring B-3 should provide reasonable permeability against subsurface seepage. However, due to the variable nature of these alluvial soils (relatively low to moderately plastic (CL) silty sandy clay soils containing silty very fine sand to silt seams and layers), proper reworking will be required. It is believed that proper reworking (using a pulverizing mixer) and compaction of these soils will result in a hydraulic conductivity (coefficient of permeability) of less than about  $1 \times 10^{-5}$  cm/sec. Based on the results of the laboratory classifications testing (Atterberg Limits and percent fines passing the No. 200 sieve), the subsurface soils encountered at this site are not typically considered suitable soils for use as "clay liner" material. Due to the presence of relatively low to moderately plastic (CL) silty sandy clay soils containing silty very fine sand to silt seams and layers, a minimum two (2) feet thick properly reworked (using a pulverizing mixer) and compacted sections should be considered for this project. It is believed that proper reworking (using a pulverizing mixer) and compaction of these soils in properly benched, horizontal lifts will result in a hydraulic conductivity (coefficient of permeability) of less than about  $1 \times 10^{-5}$  cm/sec.

The subgrade shall be prepared in accordance with the procedures outlined below. Clearing, grubbing and stripping of brush, organic topsoil and unsuitable materials shall also be accomplished in accordance with the procedures outlined below.

1. The contractor shall completely remove any surface vegetation, organic topsoil, loose organics or debris and waste. All tree stumps and associated roots, if present, shall be completely removed to depths of at least three (3) feet below existing grade prior to fill

placement, or three (3) feet below final grade, whichever is deeper. Tree stumps and root holes shall be filled in compacted lifts in accordance with Item 4, below. Usable topsoil should be stockpiled separately 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 fill areas. Likewise, proper and effective dewatering may be required within the reservoir excavations. Consideration should also be given regarding an appropriate method for discharging the groundwater during dewatering operations (outside the limits of influence related to groundwater recharge). In addition, it is recommended that drainage swales be cut adjacent to the proposed pond prior to construction to facilitate surface and subsurface drainage of any groundwater.

2. Excavation shall be performed to minimum depths of two (2) feet below the base of the pond bottom or sideslopes and replaced in properly reworked (using a pulverizing mixer) and compacted on-site clayey soils. Sideslopes along excavations should be no steeper than 2(H):1(V). Additional excavation should be performed, as needed, to provide the necessary bench cuts along sideslopes for fill placement in benched horizontal compacted lifts. **Care shall be taken during excavation to stockpile the most clayey soils suitable for liner construction separate from sandy soils suitable for general fill only (not suitable for liner construction)**. During construction, the excavated soils should be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to field delineate soils to be used for general fill and soils to be used for liner construction.

A minimum two (2) foot thick properly reworked (using a pulverizing mixer) and compacted liner should be provided along the bottom and all sideslopes of the proposed pond.

3. Fill areas shall be proofrolled prior to fill placement to detect any areas of weakness. In cut areas, the subgrade shall be cut to grade prior to proofrolling. Proofrolling shall be performed in accordance with Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2004 Edition, Item 216, Proofrolling. The proofrolling operations shall be observed by an experienced Alliance Geotechnical Group (AGG) engineer or geotechnician. Any soft or compressible areas detected by AGG field personnel during proofrolling shall be undercut until firm material is exposed. Low areas resulting from undercutting shall be filled in compacted lifts as indicated below. It cannot be overemphasized that the proofrolling is imperative to assure that a firm subgrade is present beneath the deep fills. It is also imperative that a firm subgrade be provided and maintained during construction.
4. After proofrolling, scarify the exposed subgrade to a depth of eight (8) inches and recompact to at least 95 percent of the maximum density defined by the standard Proctor test (ASTM D698). At the time of compaction, the moisture content of sandy soils having a plasticity index (PI) of 20 or less shall be within three percentage points ( $\pm 3\%$ ) of optimum moisture. Clay soils having a plasticity index (PI) greater than 20 shall be compacted at a moisture content ranging from one percent below to five percentage points above the optimum moisture value (-1% to +5%). The recommended

moisture content at the time of compaction 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>
$\leq 20$	$\pm 3\%$
$> 20$	-1% to +5%

5. Fill soils for construction of the pond embankments (other than the clayey soils used for the liner construction) may consist of on-site sandy soils. All fill shall be placed in properly benched horizontal lifts not exceeding eight (8) inches in thickness and compacted in accordance with Item 4, above.
6. Clayey fill soils used for liner construction shall consist of on-site clayey soils. During construction, the excavated soils should be inspected by an Alliance Geotechnical Group, Inc. geotechnical engineer to field delineate soils used for general fill and soils used for liner construction. All fill shall be placed in properly benched horizontal lifts not exceeding eight (8) inches in thickness and compacted in accordance with Item 4, above.

**A pulverizing mixer (commonly used during subgrade stabilization operations) should be used to achieve a relatively uniform and consistent soil mixture and uniform moisture content within each lift of fill. Equipment used should be of adequate size to assure uniform mixing and compaction is achieved within the entire 8 inch lift.**

7. All fill shall be placed in benched horizontal lifts not exceeding eight (8) inches in thickness and compacted as indicated above in Item 4. 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 the related placement and compaction operations. Placement of fill soils in sloped lifts should not be allowed, regardless of the 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.
8. Conduct in-place (nuclear) density tests (ASTM D6938) at the rate of at least one (1) test per 1,000 square feet of surface area for each lift or a minimum of three (3) tests for each lift of material, whichever is greater.
9. The moisture content and density of each fill lift shall be maintained until construction is completed and the pond is filled to the final operating level.

#### **6.4 Construction Considerations**

Relatively loose, non-plastic (PI=0) to low plasticity sandy soils are present across the surface at this 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.

The contractor should be advised that groundwater seepage should be anticipated in the form of seepage within the granular soil layers and through the cracks, fissures and fractures within the overburden clay soils, particularly if construction occurs during or after periods of heavy rainfall.

Provisions should be made to ensure the integrity of the existing structures in close proximity of the building pad excavations (including newly constructed structures and roads) during construction of the building pads and/or below grade structures. Existing buildings, roadways, and utility lines, if present, should be protected and maintained during construction. It is recommended that, as a minimum, settlement markers consisting of survey points be installed on existing structures and above any existing utility lines, if present. These settlement markers should be installed and monitored prior to and during excavation and construction of the select fill building pads and/or below grade facilities.

**6.5 Secondary Design Considerations**

The following information has been assimilated after examination with numerous problems dealing with soil strata throughout the North and Northeast Texas area. It is presented here for your convenience. If these features are incorporated in the overall design of the project, the performance of the structure will be improved.

1. Roof drainage should be obtained by a system of gutters and downspouts and transmitted by pipe to a storm drainage system or to a paved surface where water can drain away without entering the soil.
2. Pavements, sidewalks, and the general ground surface should be sloped away from the structure on all sides. Water should not be allowed to pond near the structure after the foundation units have been placed.
3. Backfill for utility lines should be carefully placed so they will be stable. The backfill should be placed in maximum eight (8) inch lifts and compacted as outlined below based on the plasticity index (PI) of the respective fill soils. Where utility lines pass through pavement areas, the upper 6 to 8 inches should be prepared and compacted similarly to the remainder of pavement subgrade.

<u>Plasticity Index (PI)</u>	<u>Moisture Content Range at Time of Compaction (%)</u>	<u>Percent Maximum Dry Density (%) *</u>
_ 15	<u>+3%</u>	95% +
16 to 25	-1% to +5%	95% +
≥ 26	+1% to +6%	95% to 100%

\* Percent of the maximum density defined by ASTM D698 (standard Proctor).

4. Unpaved areas should be protected from erosion by the establishment of a good surface vegetation cover.
5. The design depth for frost penetration in Gregg County, Texas is approximately 6 inches.

## 6.6 Quality Assurance

1. The suitability of select subgrade and Portland cement concrete materials shall 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 at the following rates for each lift of material. Compliance with compaction specifications should be required prior to the placement of additional lifts.

Building Areas: at least one (1) test per 200 square feet of surface area for each lift or a minimum of three (3) tests per construction area for each lift of material, whichever is greater.

Pond Area: at least one (1) test per 1,000 square feet of surface area for each lift or a minimum of three (3) tests per construction area for each lift of material, whichever is greater.

Paving Areas:  
Fill / Treated Subgrade: at least one (1) test per 1,000 square yards (SY) of surface area 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.

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).

## **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 stabilization, foundation installations, 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 procedures. 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. 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 MHS Planning & Design, LLC, Keep Longview Beautiful, 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**



**AGG** ALLIANCE  
GEOTECHNICAL  
GROUP

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

The Green  
Keep Longview Beautiful  
City of Longview, Texas

**PLAN OF BORINGS**

Scale: As Shown  
Project No.: LE16-005

**FIGURE NO.**  
**1**

## LOG OF BORING BORING B-1

Project: **The Green; Keep Longview Beautiful; City of Longview, Texas**

Project No.: **LE16-005**

Surface Elev.: **Existing**

Date Drilled: **2-8-16**

Location: **See Plan of Borings - Figure 1** Northing: **N/A**

Easting: **N/A**

Depth to water at completion of boring: **16'**

Depth to water when checked: **@ Completion**

was: **16'**

Depth to caving when checked: **@ Completion**

was: **17'**

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		Very loose brown silty fine SAND (SM)								
	3/6" 3/6" 3/6"	Soft to medium stiff reddish brown, brown & light gray silty sandy CLAY w/ silty sand seams & pockets	17	32	14	18	51			
3	4/6" 7/6" 6/6"	-stiff below 3'  (POSSIBLE FILL) (CL)	16	30	15	15	53			
		Loose light gray silty fine SAND  (SM)	15	--	--	NP	36			
6	2/6" 2/6" 3/6"	Soft to medium stiff reddish brown, brown & light gray silty sandy CLAY w/ silty fine sand seams & layers  (CL)	21	40	13	27	71			
9	1/6" 1/6" 2/6"	Very loose gray sandy clayey SILT w/ silty fine sand seams  (CL-ML)	20	19	13	6	59			
12		Soft to medium stiff reddish brown & gray silty sandy CLAY w/ silty fine sand seams								
15	3/6" 3/6" 3/6"		21	34	15	19	77			
18		-seepage @ 18.5' (CL)								
	2/6" 2/6" 3/6"	Loose brown silty clayey fine SAND w/ light gray clay seams  (SC)	22	33	13	20	42			

Notes: Completion Depth: 20'

Boring Backfilled with Soil Cuttings and Tamped Upon Completion.

FIGURE NO.: 2

## LOG OF BORING BORING B-2

Project: **The Green; Keep Longview Beautiful; City of Longview, Texas**

Project No.: **LE16-005**

Surface Elev.: **Existing**

Date Drilled: **2-11-16**

Location: **See Plan of Borings - Figure 1** Northing: **N/A**

Easting: **N/A**

Depth to water at completion of boring: **Dry (Backfilled)**

Depth to water when checked: **N/A**

was: **N/A**

Depth to caving when checked: **N/A**

was: **N/A**

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		Very loose brown silty fine SAND (SM)								
		Soft reddish brown, brown & light gray silty sandy CLAY w/ silty sand seams	18	37	14	23	68			
			16	30	14	16	55			
3			(CL)	18	27	18	9	64		
				17	35	13	22	59		
6										
9										
12										
15										
18										

Notes: Completion Depth: 5'

Due to Site Access Limitations to Truck-Mounted Drilling Equipment, Boring Drilled Using Hand Drilling and Sampling Techniques.

Boring Backfilled with Soil Cuttings and Tamped Upon Completion.

FIGURE NO.: 3

## LOG OF BORING BORING B-3

Project: **The Green; Keep Longview Beautiful; City of Longview, Texas**

Project No.: **LE16-005**

Surface Elev.: **Existing**

Date Drilled: **2-8-16**

Location: **See Plan of Borings - Figure 1** Northing: **N/A**

Easting: **N/A**

Depth to water at completion of boring: **Dry (Backfilled)**

Depth to water when checked: **N/A**

was: **N/A**

Depth to caving when checked: **N/A**

was: **N/A**

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		Very loose brown silty fine SAND (SM)								
	1/6" 2/6" 1/6"	Soft reddish brown, brown & light gray silty sandy CLAY w/ silty sand seams & pockets	16	27	13	14	52			
3	3/6" 4/6" 7/6"	(POSSIBLE FILL) (CL)								
		Stiff light gray & reddish brown silty CLAY, slightly sandy w/ silty fine sand seams & layers	16	40	12	28	69			
6	4/6" 5/6" 10/6"		20	41	13	28	81			
		(CL)								
9	3/6" 5/6" 7/6"	Stiff reddish brown, brown & light gray silty sandy CLAY w/ silty fine sand seams & layers	15	25	15	10	52			
		(CL)								
12		Medium stiff grayish brown silty sandy CLAY w/ iron stains & silty very fine sand to silt seams & layers								
15	2/6" 3/6" 4/6"	(SC)	20	25	13	12	61			
18										

Notes: Completion Depth: 15'

Boring Backfilled with Soil Cuttings and Tamped Upon Completion.

FIGURE NO.: 4

## KEY TO LOG TERMS & SYMBOLS

Symbol    Description

### Strata symbols



silty SAND



silty sandy CLAY



clayey sandy SILT



silty clayey SAND



silty CLAY

### Misc. Symbols



Depth to water at completion of boring



Depth to caving when checked



Depth to water when checked

### Soil Samplers



Auger



Standard Penetration Test (SPT)

Symbol    Description



Bulk sample obtained using hand drilling and sampling techniques

### 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.: 5

## **APPENDIX**

DESIGN MAPS AND DETAILED REPORTS FROM THE  
EARTHQUAKE HAZARDS PROGRAM, U.S. SEISMIC  
DESIGN MAPS, THE UNITED STATES GEOLOGIC  
SURVEY (USGS)

# USGS Design Maps Summary Report

## User-Specified Input

**Report Title** The Green; Keep Longview Beautiful; City of Longview, Texas  
Sat February 20, 2016 22:36:43 UTC

**Building Code Reference Document** 2012 International Building Code  
(which utilizes USGS hazard data available in 2008)

**Site Coordinates** 32.4945°N, 94.7539°W

**Site Soil Classification** Site Class D - "Stiff Soil"

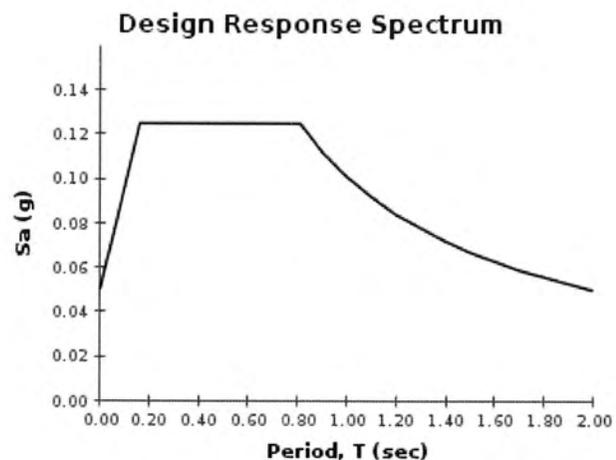
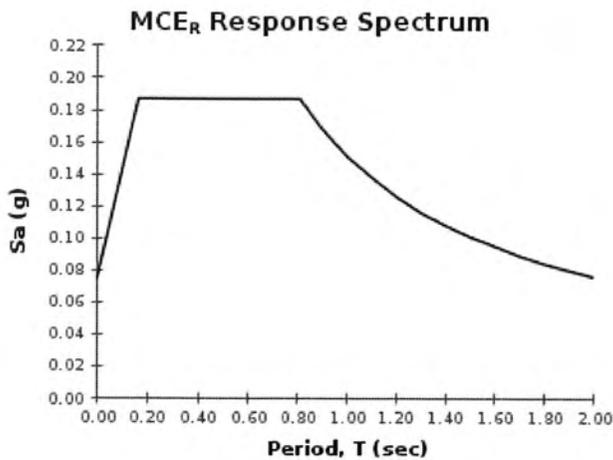
**Risk Category** I/II/III



## USGS-Provided Output

$S_s = 0.117 \text{ g}$	$S_{MS} = 0.187 \text{ g}$	$S_{DS} = 0.125 \text{ g}$
$S_1 = 0.063 \text{ g}$	$S_{M1} = 0.151 \text{ g}$	$S_{D1} = 0.101 \text{ g}$

For information on how the  $S_s$  and  $S_1$  values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.


**Design Maps Detailed Report**

2012 International Building Code (32.4945°N, 94.7539°W)

Site Class D – “Stiff Soil”, Risk Category I/II/III

**Section 1613.3.1 — Mapped acceleration parameters**

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain  $S_s$ ) and 1.3 (to obtain  $S_1$ ). Maps in the 2012 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From **Figure 1613.3.1(1)** <sup>[1]</sup>

$S_s = 0.117 \text{ g}$

From **Figure 1613.3.1(2)** <sup>[2]</sup>

$S_1 = 0.063 \text{ g}$

**Section 1613.3.2 — Site class definitions**

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1  
SITE CLASS DEFINITIONS

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
Any profile with more than 10 ft of soil having the characteristics:			
<ul style="list-style-type: none"> <li>• Plasticity index <math>PI &gt; 20</math>,</li> <li>• Moisture content <math>w \geq 40\%</math>, and</li> <li>• Undrained shear strength <math>\bar{s}_u &lt; 500</math> psf</li> </ul>			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)  
VALUES OF SITE COEFFICIENT  $F_s$

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_s$ .

**For Site Class = D and  $S_s = 0.117$  g,  $F_s = 1.600$**

TABLE 1613.3.3(2)  
VALUES OF SITE COEFFICIENT  $F_v$

Site Class	Mapped Spectral Response Acceleration at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_1$ .

**For Site Class = D and  $S_1 = 0.063$  g,  $F_v = 2.400$**

---

**Equation (16-37):**  $S_{MS} = F_a S_s = 1.600 \times 0.117 = 0.187 \text{ g}$

---

**Equation (16-38):**  $S_{M1} = F_v S_1 = 2.400 \times 0.063 = 0.151 \text{ g}$

---

Section 1613.3.4 — Design spectral response acceleration parameters

---

**Equation (16-39):**  $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.187 = 0.125 \text{ g}$

---

**Equation (16-40):**  $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.151 = 0.101 \text{ g}$

---

## Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)

SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF $S_{DS}$	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and  $S_{DS} = 0.125 g$ , Seismic Design Category = A

TABLE 1613.3.5(2)

SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF $S_{D1}$	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and  $S_{D1} = 0.101 g$ , Seismic Design Category = B

Note: When  $S_1$  is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category  $\equiv$  "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = B

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

## References

1. Figure 1613.3.1(1): [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1\(1\).pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf)
2. Figure 1613.3.1(2): [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1\(2\).pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf)