



City of Port Aransas

Project Name:

COMMUNITY CENTER NEIGHBORHOOD PARK

Project Location:

430 N. Alister

Port Aransas, TX 78373

PROJECT MANUAL

HALFF PROJECT 46201.003

MARCH 2024

City of Port Aransas
COMMUNITY CENTER NEIGHBORHOOD PARK
Port Aransas, TX

PROJECT ARCHITECT

HALFF

Contact: Layne Olivo

CIVIL ENGINEER/SURVEYING

HALFF

Contact: Thomas Everett II

STRUCTURAL/WINDSTORM ENGINEER

MEP ENGINEER

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PROJECT INFORMATION

- A. **PROJECT IDENTIFICATION Project Name: Community Center Neighborhood Park**, located at 430 N Alister St. Port Aransas TX 78373
- B. HALFF Project Number 46201.003
- C. The Owner, hereinafter referred to as City of Port Aransas, located at 710 W Ave A, Port Aransas, TX 78373

1.01 INVITATION TO PROSPECTIVE BIDDERS

- A. These documents constitute an invitation to Bid to General Contractors for the construction of the project described below.
- B. **MINORITY AND WOMEN'S BUSINESS ENTERPRISES:** The City of Port Aransas is committed to developing, establishing, maintaining, and enhancing minority involvement in all the City's procurement activities. The City's goal is to have at least a 20% M/WBE participation with all procurement processes. It is The City's wish to involve qualified minority/women owned businesses to the greatest extent feasible in the Procurement of goods, equipment, services, and construction projects. The City, its contractors, their suppliers and subcontractors, and vendors of goods, equipment services, and professional services shall not discriminate on the basis of race, color, religion, national origin, handicap, or sex in the award and/or performance of contracts. However, competition and quality of work remains the ultimate "yardstick" in contractor, subcontractor, vendor, service, professional service, and supplier utilization. All vendors, suppliers, professionals, and contractors doing business or anticipating doing business with The City of Port Aransas shall support, encourage, and implement affirmative steps toward our common goal of Establishing equal opportunity for all citizens of Port Aransas.
- C. All Contractors shall be registered with the City of Port Aransas. This can be done at City Hall and the registration fee is \$100.00.

1.03 PROJECT DESCRIPTION

- A. Summary Project Description: Demolition and New Construction of a new Neighborhood Park facility including, but not limited to; Accessible parking, Park Lighting, Pavilion and Shade structures, Landscaping, irrigation, tables, etc.
- B. Alternate bids: No Alternate Bids.
- C. Substitutions: There shall be no Substitutions allowed.

1.04 PROJECT ARCHITECT

- A. The Landscape Architect, hereinafter referred to as HALFF, Layne Olivo.
 - 1. Address: 2601 Meacham Blvd, Suite 600
 - 2. City, State, Zip: Fort Worth, TX 76137
 - 3. Phone: 817-764-7434
 - 4. E-mail: lolivo@halff.com

1.05 PROCUREMENT TIMETABLE

- A. Pre-Bid Conference: **Thursday, March 21st, 2024 at 10:00am**, local time at Port Aransas Civic Center located at 710 W. Avenue A, Port Aransas, TX 78373.
- B. Pre-Bid Site Tour: Immediately following the Pre-Bid Conference: **Thursday, March 21st, 2024** located at 430 N. Alister St., Port Aransas, TX 78373.
- C. SUBSTITUTIONS: There shall be no substitutions/alternate bids allowed.
- D. Last Request for Information Due: **4:00pm. local time on Tuesday, April 2nd, 2024.** local time.
- E. Contractor's Statement of Qualifications Due with Sealed Bid: **Friday April 5, 2024 at 2:00p.m.** local time.
- F. Bid Due Date: **Friday April 5, 2024 at 2:00p.m. local time.**
- G. Bid Opening: **Friday April 5, 2024 at 2:00p.m. local time.**
- H. Tentative Award of Bid: within 7-10 Days of Bid Due Date.
- I. Notice to Proceed: within 7-10 days of Contract execution.
- J. Commence Work: within 7-10 days after written Notice to Proceed.
- K. Bids May Not Be Withdrawn Until: 90 days after due date.
- L. Required Substantial Completion Date: Not later than the number of calendar days indicated by the Bidder, as indicated in Bid Form.
- M. Liquidated Damages: The Bidder further agrees to pay as Liquidated Damages the sum of Five Hundred Dollars (\$500.00) for each calendar day that the work is incomplete after the expiration of the calendar days specified and any extended days allowed by the Owner's Representative in accordance with the Specifications not as a penalty, but as liquidated damages and added expense for supervision and delay in obtaining the use of the work.
- N. City of Port Aransas reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

- A. Availability of Documents:
 - a. Complete set of electronic PDF documents may be obtained by contacting HALFF, via email, at lolivo@halff.com. Documents may be reproduced at the expense of the user.
 - b. On-line at www.cityofportaransas.org. Documents may be reproduced at the expense of the user.
 - c. City Hall, located at 710 W. Avenue A, Port Aransas, TX 78373.

1.07 BID SECURITY/GUARANTY

- A. Bids shall be accompanied by a security deposit as follows:
 - a. The Bid must be accompanied by a Bid guaranty that shall not be less than five percent (5%) of the amount of the Bid. At the option of the Bidder, guaranty may be a certified check, bank draft, negotiable U. S. Government Bonds (at par value) or a Bid Bond in the form attached. The Bid Bond shall be secured by a guaranty or a surety company listed in

the latest issue of U.S. Treasury Circular 570. The amount of such Bid Bond shall be within the maximum amount specified for such company in said Circular 570. No Bid will be considered unless it is accompanied by the required guaranty. Certified check or bank draft must be made payable to the order of the City of Port Aransas. Cash deposits will not be accepted. The Bid guaranty shall insure the execution of the Agreement and the furnishing of the surety bond or bonds by the successful Bidder, all as required by the Contract Documents. Certified check or bank drafts, or the amounts thereof, Bid Bonds, and negotiable U.S. Government Bonds of unsuccessful Bidders will be returned as soon as practical after the opening of the Bids.

1.08 CONTRACT DOCUMENT FORMAT

- A. Contract Documents between Owner and Contractor shall be the most current AIA Contract Document A-Series Format including, but not limited to:
 - a. AIA 101 – 2017 Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum.
 - b. AIA 201 – 2017 General Conditions of the Contract for Construction.

END OF SECTION

INSTRUCTIONS TO BIDDERS

1.1 OWNER

- A. The "Owner", hereinafter referred to as City of Port Aransas
 - a. Address: 710 W. Ave A
 - b. City, State, Zip: Port Aransas, TX 78373

1.2 PROJECT LANDSCAPE ARCHITECT

- B. The "Landscape Architect", hereinafter referred to as HALFF
 - a. Address: 2601 Meacham Blvd, Suite 600
 - b. City, State, Zip: Fort Worth, TX 76137
 - c. Phone: 817-764-7434
 - d. E-mail: lolivo@halff.com

1.3 OBTAINING DOCUMENTS AND ELECTRONIC (PDF) COPIES OF BID DOCUMENTS

- A. Bid Documents Availability (Documents may be reproduced at the expense of the user):
 - 1. Complete set of digital (PDF) documents may be obtained by contacting HALFF, via email, at lolivo@halff.com.
 - 2. On-line at www.cityofportaransas.org.
 - 3. City Hall, located at 710 W. Avenue A, Port Aransas, TX 78373.
- C. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes. Documents may be reproduced as needed; however; bidders are responsible for being fully aware of all the published documents.
- D. General Contract bidders are advised to include an amount in their bids for reproduction of documents to the extent that they deem appropriate for both bidding and construction.

1.4 ACCEPTANCE/REJECTION OF OFFER

A. REJECTION OF BIDS: The Owner reserves the right to consider as unqualified to do the work of general construction any Bidder who does not habitually perform with his own forces the major portions of the work involved in construction of the Improvements embraced in this project.

B. AWARD: The Contract will be awarded to the responsible Bidder submitting the lowest and/or best bid complying with the Contract Documents. The Owner reserves the right to accept or reject any or all bids if it is deemed to be in the best interest of the Owner. Further the Owner reserves the right to reject any bid because of irregularity or to waive such irregularity or such action as in the Owner's interest.

BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. City of Port Aransas City Secretary's office 710 W. Avenue A Port Aransas, Texas, 78373

1.02 FOR:

A. Project Name: "SEALED BID – NEIGHBORHOOD PARK CONSTRUCTION".

B. Project Address: 113 South Alister St., Port Aransas, TX 78373

1.03 BID DATE: _____

1.04 SUBMITTED BY: (Bidder to enter name and address)

A. Bidder's Full Name:

1. Bidder's Full Address:

2. City, State, Zip

1.05 OFFER

A. Having examined the Place of The Work and all matters referred to in the Contract Documents prepared by the Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____ dollars

(\$ _____), in lawful money of the United States of America. C. This Project is Tax Exempt. D. Overhead and profit shall include (but not be limited to) the following: Supervision, Insurance, Bonds, Workman's Comp, Mark-up, Job-site and Office Overhead, Coordination, Submittals and any other related expenses.

1.06 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for ninety (90) days from the bid closing date.

B. If this bid is accepted by the City of Port Aransas within the time period stated above, we will:

1. Execute the Agreement within 7-10 days of receipt of Notice of Award.
2. Furnish the required bonds within 7-10 days of receipt of Notice of Award.
3. Commence work within 7-10 days after written Notice to Proceed of this bid.

1.07 CONTRACT TIME A. If this Bid is accepted, we will:

1. Complete the Work within _____ calendar days.

1.08 LIQUIDATED DAMAGES

A. The Bidder further agrees to pay as Liquidated Damages the sum of Five Hundred Dollars (\$500.00) for each calendar day that the work is incomplete after the expiration of the calendar days specified and any extended days allowed by the Owner's Representative in accordance with the Specifications not as a penalty, but as liquidated damages and added expense for supervision and delay in obtaining the use of the work.

1.09 CHANGES TO THE WORK

A. When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:

1. _____ percent overhead and profit on the net cost of our own Work;
2. _____ percent on the cost of work done by any Subcontractor.

A. On work deleted from the Contract, our credit to the City of Port Aransas shall be Architect-approved net cost plus _____ of the overhead and profit percentage noted above.

1.10 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

1. Addendum # _____ Dated _____.
2. Addendum # _____ Dated _____.
3. Addendum # _____ Dated _____.
4. Addendum # _____ Dated _____.
5. Addendum # _____ Dated _____.

1.11 BID FORM SUPPLEMENTS

A. We agree to submit the following Supplements to Bid Forms within 24 hours of request for Supplements, for additional bid information, if requested from Architect or Owner:

1. Subcontractors List: Include the names of all Subcontractors and the portions of the Work they will perform. The City of Port Aransas reserves the right to reject any Subcontractor.
2. Cost Breakdown identifies the Bid Price/Sum segmented into portions as requested.
3. Document - Project Management Team Qualifications.

1.12 BID FORM SIGNATURE(S)

The Corporate Seal of

(Bidder - print the full name of your firm) was hereunto affixed in the presence of:

(Authorized signing officer, Title) (Seal)

(Authorized signing officer, Title)

END OF BID FORM

STATEMENT OF QUALIFICATIONS

1.1 GENERAL

Submit a Statement of Qualifications (SOQ) as required herein. The SOQ shall provide a clear and thorough description of the Respondent's Capability as it relates to this Project. As used herein, "Capability" includes all indicators of a Respondent's ability to best meet the Owner's needs and objectives, including experience, performance record, personnel, subconsultants, resources, commitment and other qualifications and indicators. All requirements and questions shall be addressed and all requested information shall be supplied. The Owner reserves the right to request additional information which may be needed to evaluate the Respondent's Capability.

1.2 SOQ FORMAT

Submit all materials in one bound document with dividers as needed. Include the following in the order listed.

Cover Sheet: Identify the Respondent and include the Project Identifier (as noted below). Other information may be included if desired.

Table of Contents: List all items included in the SOQ.

Cover Letter: Provide a signed cover letter (1-page limit) that briefly profiles the reasons why the Respondent's Capability is well suited to this Project.

SOQ Questionnaire: The SOQ Questionnaire included herein shall be completed by each firm participating in the response regardless of the relationship (i.e. joint-venture, partnership, association, etc.).

- Do not change the format, sequence or content. Provide answers directly below each Questionnaire item.
- Answers may be expanded where needed, but the resulting Questionnaire shall not exceed 15 pages.
- Font colors and styles may be changed, but fonts shall not be less than 11 point.
- The Respondent's firm name and/or logo may be added to the footers. Display the following Project Identifier prominently on the Cover Sheet and Cover Letter.

Display the following Project Identifier prominently on the Cover Sheet and Cover Letter.

"SEALED BID – NEIGHBORHOOD PARK CONSTRUCTION"

City of Port Aransas

Name of Bidder

Contractor's Statement of Qualifications

Bid Due Date and Time

1.3 SOQ EVALUATION PROCESS

The Owner will evaluate the SOQ's in accordance with the Evaluation Criteria noted herein. Such evaluation will include review of the SOQ materials, as well as other indicators of Respondent Capability.

The Owner's evaluation may include discussions, investigations, findings, compliance checks, references and information checks, and other potential indicators of the Respondent Capability.

END OF SECTION

SOQ QUESTIONNAIRE

RE: NEIGHBORHOOD PARK CONSTRUCTION

SOQ QUESTIONNAIRE

Request for Competitive Sealed Proposals

Provide the following information in the sequence and format shown in this questionnaire.

Supplemental materials providing additional information may be attached. A completed copy of this questionnaire shall be submitted by each firm participating in the response regardless of the relationship (i.e. prime contractor, joint-venture, partnership, association, etc.). All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

A. FIRM INFORMATION

Name of Firm: _____

Address of Principal Office: _____

Form of Business Organization: _____

Prime Contractor _____ Partner _____ Joint Venture _____ Other

Year Founded: _____

Primary Individual to Contact: _____

Telephone of Primary Contact: _____

Email Address of Primary Contact: _____

B. ORGANIZATION

1. How many years has your organization been in the construction business in its current capacity?

2. How many years has your organization been in business under its present name? Under what other names has your organization operated? Also, note any predecessor firms and the dates of their existence.

3. If your organization is a corporation, answer the following: Date of incorporation, State of incorporation, President's name, Vice-President's name(s), Secretary's name, Treasurer's name.

4. If your organization is a partnership, answer the following: Date of organization, type of partnership (if applicable), names of general partner(s).

5. If your organization is individually owned, answer the following: Date of organization, name of owner(s).
6. If the form of your organization is other than those listed above, describe it and name the principals.

C. EXPERIENCE AND CAPABILITY

1. Past Experience with Owner: List the projects constructed and completed by your organization for the City of Port Aransas, Texas. For each project provide the name, brief description, size, location and completion date. Include the name of Owner and Architect and their contact person with phone number.
2. Current Work: List the construction projects your organization has in progress, giving the names and location of project, contract amount, percent complete and scheduled completion date. Include name of Owner and Architect and their contact person with phone number.
3. Work During Last Five (5) Years: List important projects constructed and completed by your organization over the last five years. For each project provide the name, brief description, size location, cost, completion date. Include name of Owner and Architects and their contact person with phone number.
4. Work by Firm: List the categories of work that your organization normally performs with its own forces. On this Project, what work do you propose to do with your own forces, and what work do you propose to bid to subcontractors?
5. List your major equipment available for this contact.
6. Subcontractor List: List any subcontractors in which your organization has some ownership and list the categories of work those subcontractors normally perform.
7. Claims and Suits: (If the answer to any of the questions below is yes, please attach details.)
 - a. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers? If so, please explain.
 - b. Has your organization filed any lawsuits or requested arbitration against an Owner or a design professional with regard to construction contracts within the last fifteen years? If so, provide a detailed explanation.
 - c. Has your organization had any lawsuits or arbitration proceedings filed against it by an Owner or a design professional within the last fifteen years? If so, provide a detailed explanation
8. Failure to Complete Contracts: Within the last fifteen years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? If so, provide a detailed explanation.

D. BONDING CAPABILITIES

1. Bank Reference: Provide bank name, address, contact person, and phone for bank reference.
2. Surety: Name of bonding company, name and address of agent. A bond for 100% of the construction cost will be required. Proof of ability to bond will be required prior to selection.
3. Other Financial Information: Will you provide a financial statement and other relevant financial information if requested by the Owner after receipt of SOQs? (Do not include such information with the SOQ).

E. OTHER ITEMS FOR CONSIDERATION

1. Personnel: Given the scope and schedule of the project, identify the specific Project Managers and Job Site Superintendents who would work on the project. Provide a resume and references with phone numbers for each individual.
2. Safety: Provide your company's safety experience modifier rate for each of the last three years and OSHA 200 Log.
3. Local Participation: What work do you expect to be performed by Local Firms? What is the estimated percentage of the total Construction Cost that will be provided by Local Firms?
4. HUB/MWBE Participation: What work do you expect to be performed by HUB/MWBE Firms? What is the estimated percentage of the total Construction Cost that will be provided by HUB/MWBE Firms?
5. Responsible Firm(s): Which Firm or Firms will be responsible for this contract if so awarded?

- a. Firm Name: _____
Responsible as _____ Prime Contractor _____ Partner _____ Joint Venture _____ Other
- b. Firm Name: _____
Responsible as _____ Prime Contractor _____ Partner _____ Joint Venture _____ Other
- c. Firm Name: _____
Responsible as _____ Prime Contractor _____ Partner _____ Joint Venture _____ Other

F. QUESTIONNAIRE SIGNATURE(S)

We have received Addenda numbers _____. All portions of this Statement of Qualifications are true and correct. The undersigned is authorized to sign for and legally bind the Respondent. The undersigned authorizes City of Port Aransas, the Architect and their representatives to contact any firm, organization, or person discussed in this Statement of Qualifications regarding the Respondent's performance, financial condition and other information regarding the Respondent's capability.

_____ (Affix Corporate Seal Signature of
Authorized Signing Officer if a Corporation)

Printed Name

Title Date

END OF SOQ

NEIGHBORHOOD PARK CONSTRUCTION

City of Port Aransas, TX

PAYMENT BOND

THE STATE OF TEXAS §

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF NUECES §

That we, _____, Contractor, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Port Aransas of Nueces County, TX (hereafter called "Owner") in the full and just sum of _____ Dollars (\$ _____) for the payment of which the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that: WHEREAS the Principal entered into a certain Contract, which Contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein, with the Owner acting by, dated _____, 2023, for the construction of the NEIGHBORHOOD PARK CONSTRUCTION, in accord with the Drawings, Specifications and other Contract Documents pertaining thereto, prepared or compiled by HALFF.

NOW, THEREFORE, if the Principal shall promptly make payment to all claimants as defined in Chapter 2253, Government Code, as amended, supplying labor and materials in the prosecution of the work provided for in said Contract, as well as any changes, extensions, deletions or modifications thereof which may be made by Owner, with or without notice to Surety, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED that any additions, deletions, alterations or changes which may be made in the terms of the Contract or in the Drawings, Specifications or other Contract Documents, or in the work to be done thereunder, or the making by the Owner of any payment or pre-payment under the Contract, or the giving by the Owner of any extension of time for the performance of the Contract, or the granting of any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal or the Surety, or either of them, their heirs, executors, administrators, successors or assigns, from their liability or the liability of any of them hereunder, notice to the Surety of any such addition, deletion, alteration, change, payment, prepayment, extension or forbearance being hereby expressly waived.

PROVIDED FURTHER, that this bond is made and entered into solely for the protection of all claimants as defined in Chapter 2253, Government Code, as amended, supplying labor and material in the prosecution of the work provided for in said Contract, and each such 435975/SSH claimant shall have a direct right of action under the bond as provided in such Chapter 2253, Government Code, as amended.

EXECUTED on _____, 20__.

PRINCIPAL

SURETY

Contractor

(Name)

By

Name:

Attorney-in-Fact:

Title:

Name:

ATTEST:

*Name:

*Title:

Address of Contractor:

Address of Surety:

*Typed or clearly printed

NEIGHBORHOOD PARK CONSTRUCTION

City of Port Aransas, TX

PERFORMANCE BOND

THE STATE OF TEXAS §

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF NUECES §

That we, _____, Contractor, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Port Aransas of Nueces County, TX (hereafter called "Owner") in the full and just sum of _____ Dollars (\$_____) for the payment of which the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that: WHEREAS the Principal entered into a certain Contract with The City of Port Aransas the Owner, dated _____, 20____, for the construction of the **NEIGHBORHOOD PARK CONSTRUCTION**, in accord With the Drawings, Specifications and other Contract Documents pertaining thereto, prepared or compiled by HALFF.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform the Contract in accord with the Drawings, Specifications, and other Contract Documents pertaining thereto, as well as any changes, extensions, deletions or modifications thereof which may be made by Owner, with or without notice to the Surety, and shall fully indemnify and save harmless the Owner from all costs and damage which Owner may suffer by reason of Principal's default or failure so to do, shall fully reimburse and repay Owner all outlay and expense which Owner may incur in making good any such default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED that any additions, deletions, alterations or changes which may be made in the terms of the Contract or in the Drawings, Specifications or other Contract Documents, or in the work to be done thereunder, or the making by the Owner of any payment or pre-payment under the Contract, or the giving by the Owner of any extension of time for the performance of the Contract, or the granting of any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal or the Surety, or either of them, their heirs, executors, administrators, successors or assigns, from their liability or the liability of any of them hereunder, notice to the Surety of any such addition, deletion, alteration, change, payment, prepayment, extension or forbearance being hereby expressly waived.

PROVIDED FURTHER, that if any legal action be filed upon this bond, venue shall lie in Nueces County, State of Texas and that said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in

any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extensions of time, alteration or addition to the terms of the contract or to the work or to the specifications. EXECUTED on _____, 20__.

PRINCIPAL

SURETY

Contractor

(Name)

By _____

Name: _____ Attorney-in-Fact: _____

Title: _____ Name: _____

ATTEST:

*Name: _____

*Title: _____

Address of Contractor:

Address of Surety:

*Typed or clearly printed

INSURANCE REQUIREMENTS

INSURANCE REQUIREMENTS:

Upon submittal of this request for proposal the submitting Contractor shall procure, pay for, and maintain at minimum the following insurance coverage's with the stated limits or greater. Said insurance shall be evidenced by delivery to the Owner of

1. Certificates of insurance executed by the insurers listing coverage's and limits, expiration dates and terms of policies and all endorsements, whether or not required by the Owner, and listing all carriers issuing said policies; and
2. Upon request a certified copy of each policy, including all endorsements.

The insurance requirements shall remain in effect throughout the term of this Contract and any additional extensions. In addition, the Owner reserves the right to request physical evidence of this coverage by requesting the policy declaration page, and/or an estopped from the agent and/or company verifying the coverage is and/or has been continually in effect.

The Contractor shall secure and maintain, at its sole cost and expense during the contract term and any subsequent extensions, the following insurance:

- a. **Commercial General Liability** - in the amount of five million dollars (\$5,000,000.00) aggregate/one million dollars (\$1,000,000.00) per occurrence. The General Aggregate limit shall either apply separately to the resulting contractor or shall be at least twice the required occurrence limit.
- b. **Comprehensive Automobile and Water Vehicle Liability** - covering any automotive equipment to be used in performance of the service, with a minimum limit in the amount of one million dollars (\$1,000,000.00) per occurrence combined single limit / Any Auto. Physical Damage Insurance covering owned or rented machinery, tools, equipment, office trailers, and vehicles.
- c. **Worker's Compensation** - Proposer shall provide a policy with employer's liability coverage with limits of not less than one million dollars (\$1,000,000.00) per occurrence for each accident or illness. The Worker's Compensation policy shall state that it cannot be cancelled or materially changed without first giving thirty (30) days prior notice thereof in writing to the Owner. Firms that have owner/operators that have filed a "Notice of Election to be Exempt" shall supply a signed copy of said notice. Any such exemption shall meet the requirements that qualify for an exemption under the applicable Worker's Compensation law.

POLLUTION AND REMEDIATION LIABILITY

A. **Limits:** with limits of not less than five million dollars (\$5,000,000.00) annual aggregate / two million dollars (\$2,000,000.00) per occurrence, including the cost of defense during the term of the contract and for a period of five (5) years following the completion thereof. Such coverage shall include, but not be limited to:

- i. Pollution Legal Liability- (legal liability arising out of the discharge, dispersal, release, seepage, migration or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gasses, hazardous materials, waste materials, or other irritants, contaminants, pollutants, into or upon the land, the atmosphere, or any watercourse or body of water, including groundwater at, under, or emanating from the work).
- ii. Remediation Legal Liability Expense - expenses incurred for or in connection with investigation, monitoring, removal, disposal, treatment, or neutralization of a condition arising from the discharge, dispersal release, seepage, migration, or escape of smoke, vapors, soot, fumes acids, alkalis toxic chemicals, liquids or gases, hazardous materials, waste materials, or other irritants, contaminants, or pollutants into or upon the land, the atmosphere, or any watercourse or body of water, including groundwater at, under, or emanating from the work, as well as the cost to repair or replace real or personal property damaged during the course of Remediation Expense in order to restore the required Federal, State, Local, or Provincial laws, ordinances, regulations, or statutes, or any subsequent amendments thereof; and
- i. Transportation Legal Liability / Expense Pollution Legal Liability or Remediation Legal Liability/Expense arising out of the movement by the Contractor of product or waste of the Owner to its final delivery point as specified in the resulting contract.

Contractor agrees that the insurer shall waive its rights of subrogation, if any, against the Owner on Commercial General Liability and Worker's Compensation insurance coverage. The ACORD Certificate of Liability Insurance, with endorsements, shall be completed by the authorized Agent and returned to the Owner.

Loss Deductible Clause: The Owner shall be exempt from, and in no way liable for, any sums of money that may represent a deductible in any insurance policy. The payment of such deductible shall be the sole responsibility of the Contractor.

The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, its subcontractors of every tier, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable.

B. CONDITIONS:

Each insurance policy shall include the following conditions by endorsement to the policy:

- i. Each policy shall require that thirty (30) days prior to expiration, cancellation, nonrenewal or any material change in coverage's or limits, a notice thereof shall be given to the Owner by certified mail to: Contractor shall also notify the Owner, in a like

manner, within twenty-four (24) hours after receipt, of any notices of expiration, cancellation, non-renewal, or material change in coverage received by said Contractor from its insurer; and nothing contained herein shall absolve the Contractor of this requirement to provide notice.

- ii. Companies issuing the insurance policy, or policies, shall have no recourse against the Owner for payment of premiums.

The term "Owner" shall include all Authorities, Boards, Bureaus, Commissions, Divisions, Departments, and Offices of the City and individual members, elected officials, employees thereof in their official capacities, and/or while acting on behalf of the Owner.

Owner shall be named as an additionally insured on all policies of insurance. The policy clause "Other insurance" shall not apply to any insurance coverage currently held by the Owner to any such future coverage, or to the Owner's Self-Insured Retentions as, if any, of whatever nature.

END OF SECTION

CONTRACTOR'S RELEASE AND WAIVER OF LIEN

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned _____, hereinafter termed "CONTRACTOR", hereby waives and releases any and all liens and any and all claims and right to liens, against at _____ (city), _____ (state), for _____, hereinafter termed "SAID PROJECT", and upon any and all other property owned by or the title to which is in the name of _____, and upon any and all funds or monies appropriate or available for the construction and/or equipping of said hereinabove-mentioned project, and any and all warrants drawn upon or issued against any such funds or monies which Contractor may have acquired or possess, or may hereafter acquire or possess, as a result or on account of the furnishing by the undersigned or Labor or materials, or both, used in connection with the construction or equipping of said project, whether furnished by the undersigned under and pursuant to the certain Contract between it and said _____, bearing date of _____ and pertaining to said project, or otherwise, and which said liens or claims or right of lien may exist under the laws of the State of _____.

The undersigned further hereby acknowledges that the sum of _____ Dollars (\$ _____) constitutes the entire balance due the undersigned from said _____ for all labor and materials furnished and work done by it, upon or for said project and/or under said Contract and that the payment in full to the undersigned for everything furnished and/or done by the Contract or otherwise, and will satisfy in full, and will operate to fully and completely release said _____, and all claims, demands, of whatever nature, which the undersigned may have or assert against it, arising out of construction and equipping of said project, said Contract, and any and all things done or furnished by the undersigned in connection herewith.

DATED THIS _____ day of _____, 20__.

Witness to Signature:

Title: By:

Title: By:

Community Center Park Expansion

Landscape Technical Specifications

100% BID SET



2024-03-13



2601 Meacham Blvd, Suite 600
Fort Worth, TX 76167
P: (817) 764-7434
TPBE Firm #312

DIVISION 1 – GENERAL REQUIREMENTS

01 25 00.....	SUBSTITUTION PROCEDURES
01 30 00.....	ADMINISTRATIVE REQUIREMENTS
01 50 00.....	TEMPORARY FACILITIES AND CONTROLS
01 51 00.....	TEMPORARY UTILITIES
01 58 13.....	TEMPORARY PROJECT SIGNAGE
01 60 00.....	PRODUCT REQUIREMENTS
01 74 19.....	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 78 00.....	CLOSEOUT SUBMITTALS

DIVISION 3 – CONCRETE

03 10 00.....	CONCRETE FORMING AND ACCESSORIES
03 30 00.....	CAST-IN-PLACE CONCRETE

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 10 00.....	ROUGH CARPENTRY
06 17 53.....	SHOP-FABRICATED WOOD TRUSSES
06 18 00.....	GLUED-LAMINATED CONSTRUCTION

DIVISION 09 – FINISHES

09 91 13.....	EXTERIOR PAINTING
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DIVISION 31 – EARTHWORK

31 63 29	DRILLED CONCRETE PIERS AND SHAFTS
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DIVISION 32 - EXTERIOR IMPROVEMENTS

32 33 00.....	SITE FURNISHINGS
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32 84 23..... IRRIGATION

32 91 19..... LANDSCAPE GRADING

32 92 19..... SEEDING

32 92 23..... SODDING

32 93 00..... PLANTS

**SECTION 01 25 00
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:

- d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.

3.03 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

**SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Contractor's daily reports.
- F. Progress photographs.
- G. Coordination drawings.
- H. Number of copies of submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: General product requirements.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract, _____ and Architect.

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.04 DAILY CONSTRUCTION REPORTS

- A. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at weekly intervals.
 1. Submit in format acceptable to Owner.
- B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. Major equipment at Project site.

5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Unusual events (submit a separate special report).
9. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
10. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
11. Change Orders received and implemented.
12. Testing and/or inspections performed.
13. List of verbal instruction given by Owner and/or Architect.
14. Signature of Contractor's authorized representative.

3.05 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Submit new photographs at least once a month, within 3 days after being taken.
- C. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- D. Photography Type: Digital; electronic files.
- E. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- F. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Structural framing in progress and upon completion.
 5. Final completion, minimum of ten (10) photos.
- G. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- H. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.06 COORDINATION DRAWINGS

- A. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.
 - a. Do not forward requests which solely require internal coordination between subcontractors.
 - 2. Prepare in a format and with content acceptable to Owner.
 - 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 - 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 - 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 - 2. Owner's, Architect's, and Contractor's names.
 - 3. Discrete and consecutive RFI number, and descriptive subject/title.
 - 4. Issue date, and requested reply date.
 - 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 - 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 - 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 - 2. Note dates of when each request is made, and when a response is received.
 - 3. Highlight items requiring priority or expedited response.
 - 4. Highlight items for which a timely response has not been received to date.

- H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

3.08 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
 - 2. Coordinate with Contractor's construction schedule and schedule of values.
 - 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 - 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

3.09 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Design data.
 - 3. Shop drawings.
 - 4. Samples for selection.
 - 5. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Certificates.
 - 2. Test reports.
 - 3. Inspection reports.
 - 4. Manufacturer's instructions.
 - 5. Manufacturer's field reports.
 - 6. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.

2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Use a separate transmittal for each item.
 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 9. Provide space for Contractor and Architect review stamps.
 10. When revised for resubmission, identify all changes made since previous submission.
- B. Product Data Procedures:
 1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
 1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
 - 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "No Exceptions Taken", or language with same legal meaning.
 - b. "Exceptions Taken, Resubmission not Required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Exceptions Taken, Resubmit for Record", or language with same legal meaning.
 - 2. Not Authorizing fabrication, delivery, and installation:
- E. Architect's and consultants' actions on items submitted for information:
 - 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dewatering
- B. Temporary sanitary facilities.

1.02 RELATED REQUIREMENTS

- A. Section 01 51 00 - Temporary Utilities.
- B. Section 01 55 00 - Vehicular Access and Parking.
- C. Section 01 58 13 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 51 00

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.
- C. New permanent facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Construction: Contractor's option.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.08 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 51 00
TEMPORARY UTILITIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls:

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

1.04 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from utility source.
- C. Power Service Characteristics: 120/240 volt, 60 ampere, three phase, four wire.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- E. Provide main service disconnect and over-current protection at convenient location and meter.
- F. Permanent convenience receptacles may be utilized during construction.
- G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.

1.06 TEMPORARY HEATING

- A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

1.07 TEMPORARY VENTILATION

1.08 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Project informational signs.

1.02 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr (80 km/hr) wind velocity.
- B. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch (19 mm) thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of _____ color.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign, 48 sq ft (4.5 sq m) area, bottom 6 feet (2 m) above ground.
- B. Content:
 - 1. Project number, title, logo and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of authorities.
 - 3. Names and titles of Architect and Consultants.
 - 4. Name of Prime Contractor and major Subcontractors.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.02 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.03 QUALITY ASSURANCE

- A. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles (160.9 Km) from the Project site.
- B. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
 - 1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
 - 2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.
- C. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
 - 1. In every case, indicate the location of final assembly.
 - 2. For harvested products, indicate location of harvest.
 - 3. For extracted (i.e. mined) products, indicate location of extraction.
 - 4. For recovered products, indicate location of recovery.
 - 5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
 - 6. Acceptable Evidence:
 - a. Manufacturer's certification.
 - b. Life cycle analysis (LCA) performed by third-party.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.

- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 - 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards (cubic meters).
 - c. Include weight tickets as evidence of quantity.
 - 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

**SECTION 01 78 00
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Materials transparency manual.
- D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Materials Transparency Manual:
 - 1. Compile and submit a digital and a printed version of information disclosing materials content for interior finishes, furnishings (including workstations), built-in furniture. Meet IWBI (BS) requirements for format and content.
- D. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

2.02 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

2.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

2.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

2.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

**SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

- A. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI SPEC-301 - Specifications for Concrete Construction 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.02 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.03 FORMWORK ACCESSORIES

- A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Do not use materials containing diesel oil or petroleum-based compounds.
 - 2. Composition: Colorless, reactive, water-based compound.
- B. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
- C. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.

- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

3.06 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.08 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

END OF SECTION

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete reinforcement.
- C. Joint devices associated with concrete work.
- D. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- D. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.
- C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction 2015.
- D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- E. ACI PRC-305 - Guide to Hot Weather Concreting 2020.
- F. ACI PRC-306 - Guide to Cold Weather Concreting 2016.
- G. ACI PRC-308 - Guide to External Curing of Concrete 2016.
- H. ACI SPEC-301 - Specifications for Concrete Construction 2020.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2023.
- L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- M. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- N. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- O. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.
- P. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2023.
- Q. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.
- R. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

- B. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
- E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 BONDING AND JOINTING PRODUCTS

- A. Slab Isolation Joint Filler: 1/2-inch (13 mm) thick, height equal to slab thickness, with removable top section forming 1/2-inch (13 mm) deep sealant pocket after removal.
- B. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.

2.05 CURING MATERIALS

- A. Curing Agent, Water-Cure Equivalent Type: Clear, water-based, non-film-forming, liquid-water cure replacement agent.
 - 1. Comply with ASTM C309 standards for water retention.
 - 2. Comply with ASTM C309 standards for water retention.
 - 3. Compressive Strength of Treated Concrete: Equal to or greater than strength after 14-day water cure when tested in accordance with ASTM C39/C39M.
 - 4. VOC Content: Zero.

2.06 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
 - 2. Water-Cement Ratio: Maximum 40 percent by weight.
 - 3. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
 - 4. Maximum Slump: 3 inches (75 mm).
 - 5. Maximum Aggregate Size: 5/8 inch (16 mm).

2.07 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.

3.04 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 feet (3 m).
 - 2. Under Seamless Resilient Flooring: 1/4 inch (6 mm) in 10 feet (3 m).
 - 3. Under Carpeting: 1/4 inch (6 mm) in 10 feet (3 m).
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.07 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.

- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.10 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Exposed timber structural framing.
- C. Nonstructural dimension lumber framing.
- D. Preservative treated wood materials.
- E. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- C. Section 06 18 00 - Glued-Laminated Construction.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.
- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).
- D. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2018, with Errata (2019).
- E. AWPA U1 - Use Category System: User Specification for Treated Wood 2023.
- F. PS 20 - American Softwood Lumber Standard 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Samples: For rough carpentry members that will be exposed to view, submit two samples, ____ by ____ inch (____ by ____ mm) in size illustrating wood grain, color, and general appearance.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Provide sustainably harvested wood; see Section 01 60 00 - Product Requirements for requirements.

- C. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted in lieu of sustainably harvested lumber provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source.

2.02 EXPOSED DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings.
- B. Surfacing: S4S.
- C. Moisture Content: S-dry or MC19.

2.03 STRUCTURAL COMPOSITE LUMBER

- A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
 - 1. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi (12,410 MPa), minimum.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, Stainless steel elsewhere.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653M.
- C. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.
- D. General Purpose Construction Adhesives: Comply with ASTM C557.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches (450 mm) above grade.
 - 2. Preservative Pressure Treatment of Lumber in Contact with Soil: AWWA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
 - b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.08 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated wood trusses.
- B. Preservative treatment of wood.

1.02 REFERENCE STANDARDS

- A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction 2014.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.
- C. AWP A U1 - Use Category System: User Specification for Treated Wood 2023.
- D. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses 2018 (Updated 2020).

1.03 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Handle trusses in accordance with SBCA (BCSI).
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

- A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.
 - 1. Structural Design: Comply with applicable code for structural loading criteria.

2.02 MATERIALS

- A. Lumber:
 - 1. Moisture Content: Between 7 and 9 percent.
 - 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: ASTM A666, Type 304 stainless steel; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.

2.04 WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Preservative Pressure Treatment of Lumber: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention (to 4.0 kg/cu m retention).
 - 1. Kiln dry after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.02 ERECTION

- A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Install permanent bridging and bracing.

3.03 SITE-APPLIED WOOD TREATMENT

- A. Treat all site-sawn cuts of pressure-treated wood using same type of treatment (i.e. preservative or fire-retardant).
- B. Apply preservative treatment to non-pressure-treated wood wherever it will come into contact with cementitious materials, roofing, asphaltic materials, or metals.
- C. Allow field-applied treatment to dry prior to erecting members.

END OF SECTION

**SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glue laminated wood beams and purlins.
- B. Preservative treatment of wood.
- C. Steel hardware and attachment brackets.

1.02 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.
- B. AWWA U1 - Use Category System: User Specification for Treated Wood 2023.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 GLUED-LAMINATED UNITS

- A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
 - 1. Verify dimensions and site conditions prior to fabrication.
 - 2. Cut and fit members accurately to length to achieve tight joint fit.
 - 3. Fabricate member with camber built in.
 - 4. Do not splice or join members in locations other than those indicated without permission.
 - 5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.02 MATERIALS

- A. Steel Connections and Brackets: ASTM A666, Type 304 stainless steel.

2.03 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWWA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Preservative Pressure Treatment:
 - 1. Preservative Pressure Treatment of Glued-Laminated Structural Units: AWWA U1, Use Category UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention (to 4.0 kg/cu m retention).
 - a. Kiln dry lumber after treatment and before lamination to maximum moisture content of 19 percent.
 - 2. Marking: Marked each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.

2.04 FABRICATION

- A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.
- B. Verify dimensions and site conditions prior to fabrication.
- C. Cut and fit members accurately to length to achieve tight joint fit.
- D. Do not splice or join members in locations other than those indicated without permission.
- E. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports are ready to receive units.
- B. Verify sufficient end bearing area.

3.02 ERECTION

- A. Lift members using protective straps to prevent visible damage.
- B. Set structural members level and plumb, in correct positions or sloped where indicated.

END OF SECTION

**SECTION 09 91 13
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214. Select paint to be suitable for coastal areas, high resistance to mildew, salt damage, and water damage.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Alkali-Resistant Water-Based Primer.
 - 2. Alkyd/Oil Primer for Exterior Wood; MPI #5.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Fiber Cement Siding: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
- G. Masonry:

- H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- I. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- J. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

3.03 APPLICATION

- A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

3.07 COLOR SCHEDULE

- A. Exterior Wood Shiplap: SW 7006, Extra White.

END OF SECTION

SECTION 31 63 29
DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dry-installed drilled piers.

1.2 UNIT PRICES

- A. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments are made on net variation of total quantities, based on design dimensions for shafts and bells.
 - 1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.
 - 2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.
- B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed outside dimensions of drilled piers cast against rock. Unit prices for rock excavation include replacement with approved materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material certificates.

- C. Material test reports.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Record drawings.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.8 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 - 2. The geotechnical report is included elsewhere in the Project Manual.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each drilled pier and indicate on record Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Drilled-Pier Standard: ACI 336.1 except as modified in this Section.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II.
- B. Normal-Weight Aggregate: ASTM C 33/C 33M, graded, 3/4-inch- nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 STEEL CASINGS

- A. Steel Pipe Casings: ASTM A 283/A 283M, Grade C, or ASTM A 36/A 36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.

2.5 CONCRETE MIXTURES AND MIXING

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Proportion normal-weight concrete mixture as follows:
 - 1. Compressive Strength (28 Days): 3600 psi.
- E. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered.
- B. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
- C. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
 - 1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
 - 2. Payment for additional authorized excavation is according to Contract provisions for changes in the Work.
- D. End-Bearing Drilled Piers: Probe with auger to a depth below bearing elevation, equal to diameter of the bearing area of drilled pier. Determine whether voids, clay seams, or solution channels exist.
- E. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.
- F. Bells: Excavate bells for drilled piers to shape, base thickness, and slope angle indicated. Excavate bottom of bells to level plane and remove loose material before placing concrete.
- G. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.

3.2 INSTALLATION

- A. Install steel casings of minimum wall thickness indicated and of diameter not less than diameter of drilled pier.
- B. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- C. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by a qualified testing agency.
- D. Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
- E. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing. Vibrate top 60 inches of concrete after withdrawal of temporary casing.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Drilled piers.
 - 2. Excavation.
 - 3. Concrete.
 - 4. Steel reinforcement welding.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
 - 1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities are determined by testing and inspecting agency. Final evaluations and approval of data are determined by Architect.
- D. Concrete Tests and Inspections: ACI 301.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 316329

**SECTION 32 33 00
SITE FURNISHINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Benches.
- B. Tables.
- C. Waste receptacles.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Bollard infill and underground encasement.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 METAL FURNISHINGS

- A. Benches: Metal frame and seat section with back.
 - 1. Frame: Steel.
 - 2. Seat: Wood slat.
 - 3. Length: 72 inches (1820 mm).
 - 4. Width: 20 inches (500 mm).
 - 5. Height: 18 inches (450 mm).
 - 6. Products:
 - a. mmcite; Vera Solo LVC311, Thermally modified wood seat, surface mount : <https://www.mmcite.com/us/vera-solo>.
- B. Waste Receptacles: Steel frame with wood slats and fixed lid rain cover with open sides.
 - 1. Capacity: 14 gallons (50 liters).
 - 2. Shape: Rounded Square.
 - 3. Width: 15 inches (385 mm).
 - 4. Height: 31 inches (785 mm).
 - 5. Lids:
 - a. Material: Aluminum and Thermally Modified Wood.
 - b. Type: Flat.
 - 6. Mounting: Surface.
 - 7. Products:
 - a. mmcite; QB145: <https://www.mmcite.com/us/quinbin>
- C. Metal Tables and Seating:
 - 1. Frame: Aluminum.
 - 2. Slats: Thermally modified wood.
 - 3. Seating: Compliant with ADA Standards.

4. Shape: Rectangle.
5. Length: 72 inches (1820 mm).
6. Width: 28 inches (710 mm).
7. Height: 28 inches (720 mm).
8. Mounting: Surface, using concealed anchor rods.
9. Products:
 - a. mmcite; LVS911: <https://www.mmcite.com/us/vera-solo-table>.
 - b. mmcite; Vera Solo LVC311: <https://www.mmcite.com/us/vera-solo>.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.
- B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.
- B. Provide level mounting surfaces for site furnishing items.

END OF SECTION

**SECTION 32 84 23
UNDERGROUND SPRINKLERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.
- B. Control system.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating for irrigation piping.
- B. Section 31 23 23 - Fill: Backfilling for irrigation piping.

1.03 REFERENCE STANDARDS

- A. ASTM B32 - Standard Specification for Solder Metal 2020.
- B. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- C. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.
- D. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.
- E. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 IRRIGATION SYSTEM

- A. Manufacturers:
 - 1. Rain Bird Sales, Inc: www.rainbird.com/#sle.
 - 2. Hunter Industries: www.hunterindustries.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PIPE MATERIALS

- A. PVC Pipe: ASTM D2241; 200 psi (1.38 MPa) pressure rated upstream from controls, 160 psi (1.10 MPa) downstream; solvent welded sockets.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A); annealed temper.
- C. Copper Pipe: ASTM B42, regular type.
- D. Fittings: Type and style of connection to match pipe.
- E. Pipe Risers at Valves: 160 psi (1.10 MPa) PVC pipe.
- F. Pipe Risers at Valves: 100 psi (0.69 MPa) ABS pipe.
- G. Pipe Risers at Valves: 200 psi (1.4 MPa) copper pipe.
- H. Solvent Cement: ASTM D2564 for PVC pipe and fittings.
- I. Solder and Flux: ASTM B32 solder, with suitable flux.
- J. Sleeve Material: PVC.

2.03 OUTLETS

- A. Outlets: Brass construction.
- B. Rotary Type Sprinkler Head: Fixed type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.
- C. Bubbler: Adjustable outlet and _____.

D. Quick Coupler: _____.

2.04 VALVES

- A. Gate Valves: Bronze construction non-rising stem.
- B. Backflow Preventers: Iron body construction, double check valve type.
- C. Valve Box and Cover: _____.
- D. Drain Valve: _____.

2.05 CONTROLS

- A. Controller: Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, timer for a 4 station system, programmable for 7 days in quarter hour increments, with automatic start and shutdown.
- B. Controller Housing: NEMA 250 Type 3; weatherproof, watertight, with lockable access door.
- C. Valves: Hydraulic; normally open; hydraulic tubing, including required fittings and accessories.
- D. Wire Conductors: Color coded.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify location of existing utilities.
- B. Verify that required utilities are available, in proper location, and ready for use.

3.02 PREPARATION

- A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.
- B. Layout and stake locations of system components.
- C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.03 TRENCHING

- A. Trench and backfill in accordance with Section 31 23 16 and Section 31 23 23.
- B. Trench to accommodate grade changes and slope to drains.
- C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 INSTALLATION

- A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
- B. Connect to utilities.
- C. Set outlets and box covers at finish grade elevations.
- D. Provide for thermal movement of components in system.
- E. Use threaded nipples for risers to each outlet.
- F. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 40 00 - Quality Requirements.
- B. Prior to backfilling, test system for leakage at main piping to maintain 100 psi (690 kPa) pressure for one hour.
- C. System is acceptable if no leakage or loss of pressure occurs and system self drains during test period.

3.06 BACKFILLING

- A. Provide 3 inch (75 mm) sand cover over piping.

- B. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

3.07 SYSTEM STARTUP

- A. Prepare and start system in accordance with manufacturer's instructions.
- B. Adjust control system to achieve time cycles required.
- C. Adjust head types for full water coverage as directed.

3.08 CLOSEOUT ACTIVITIES

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

3.09 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide one complete spring start-up and a fall shutdown by installer, at no extra cost to Owner.

END OF SECTION

**SECTION 32 91 19
LANDSCAPE GRADING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Topsoil placement.
- B. Finish grading.

1.02 RELATED REQUIREMENTS

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 22 00 - Grading.
- C. Section 31 23 16 - Excavation.
- D. Section 31 23 23 - Fill.
- E. Section 32 92 19 - Seeding.

1.03 REFERENCE STANDARDS

- A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).

1.04 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
- B. Field Quality Control Submittals: Topsoil depth measurements.

1.05 FIELD CONDITIONS

- A. Place topsoil during dry weather.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Topsoil excavated on-site.
 - 1. Free of roots, rocks larger than 1/2 inch (12 mm), subsoil, debris, large weeds and foreign matter.
 - 2. Acidity Range (pH): 5.5 to 7.5.
 - 3. Comply with ASTM D2487 Group Symbol OH.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify grading and intended elevations are as indicated on drawings.
- B. Verify absence of standing or ponding water.

3.02 PREPARATION

- A. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size.
- B. Scarify surface to depth of 3 inches (75 mm).

3.03 TOPSOIL PLACEMENT

- A. Uniformly distribute and spread topsoil.
- B. Place topsoil in areas where seeding, sodding, and planting as indicated on drawings.
- C. Place topsoil to the following compacted thicknesses:
 - 1. Areas Indicated Seeded with Grass: 6 inches (150 mm).
 - 2. Areas Indicated as Sodded: 4 inches (100 mm).
 - 3. Shrub Beds: 18 inches (450 mm).
 - 4. Flower Beds: 12 inches (300 mm).

3.04 FINISH GRADING

- A. Maintain profiles and contour of subgrade.
- B. Remove roots, weeds, rocks, and foreign material while spreading.
- C. Maintain uniform topsoil thickness.
- D. Lightly compact placed topsoil.

END OF SECTION

SECTION 32 92 19 SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Placing topsoil.
- B. Seeding, mulching and fertilizer.
- C. Soil pH neutralizer.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Preparation of subsoil topsoil in preparation for the work of this section.
- B. Section 32 91 19 - Landscape Grading: Topsoil placement and finish grading.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

2.02 SEED MIXTURE

- A. Seed Mixture:

2.03 SOIL MATERIALS

- A. Topsoil: Tsee Section 329119.

2.04 ACCESSORIES

- A. Mulching Material: Thermally refined wood fiber, nontoxic, free of growth or germination inhibiting ingredients, dust form.
- B. Fertilizer: Recommended for grass, slow release nitrogen, biological materials, and biostimulant materials; of proportion necessary to eliminate deficiencies of topsoil.
- C. Biostimulant: Recommended to accelerate vegetation establishment.
- D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

- A. Place topsoil in accordance with Section 329119.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 SOIL NEUTRALIZER

- A. Apply in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply soil neutralizer at same time or with same machine used to apply seed.

- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid dissipation.

3.05 SEEDING

- A. Apply seed at a rate of ____ lbs per 1000 sq ft (____ Kg per 1000 sq m) evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.
- E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

3.06 PROTECTION

- A. Cover seeded slopes where grade is 4 inches per foot (____ mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.07 MAINTENANCE

- A. See Section 32 01 90 - Operation and Maintenance of Planting for post-occupancy maintenance.

END OF SECTION

SECTION 32 92 23 SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fertilizing.
- B. Sod installation.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Topsoil material.
- B. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- C. Section 31 23 23 - Fill: Topsoil material.

1.03 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REFERENCE STANDARDS

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding 2006.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.

1.08 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft (100 sq m). Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
- B. Topsoil: Excavated from site and free of weeds.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.02 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.

- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.03 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches (300 mm) minimum. Do not stretch or overlap sod pieces.
- D. Water sodded areas immediately after installation. Saturate sod to 4 inches (100 mm) of soil.
- E. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding ____ lbs. (Roll sodded areas with roller not exceeding ____ kg.)

3.04 MAINTENANCE

- A. See Section 32 01 90 - Operation and Maintenance of Planting for post-occupancy maintenance.

END OF SECTION

SECTION 32 93 00 PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Topsoil bedding.
- C. New trees, plants, and ground cover.
- D. Mulch and Fertilizer.
- E. Tree Pruning.

1.02 RELATED REQUIREMENTS

- A. Section 32 01 90 - Operation and Maintenance of Planting: Post-occupancy maintenance.
- B. Section 32 91 19 - Landscape Grading: Topsoil placement and finish grading.

1.03 REFERENCE STANDARDS

- A. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning) 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.
- B. Tree Pruner Qualifications: Company specializing in pruning trees with proof of Arborist Certification.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- B. Protect and maintain plant life until planted.
- C. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.07 FIELD CONDITIONS

- A. Do not install plant life when ambient temperatures may drop below 35 degrees F (2 degrees C) or rise above 90 degrees F (32 degrees C).
- B. Do not install plant life when wind velocity exceeds 30 mph (48 k/hr).

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

1.09 MAINTENANCE (SEE END OF SECTION)

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

PART 2 PRODUCTS

2.01 PLANTS

- A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

2.02 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

2.03 SOIL AMENDMENT MATERIALS

- A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.

2.04 MULCH MATERIALS

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2.05 ACCESSORIES

- A. Wrapping Materials: Burlap.
- B. Stakes: Softwood lumber, pointed end.

2.06 TOP SOIL MIX

- A. A uniform mixture of 1 part peat and 3 parts topsoil by volume.

2.07 SOURCE QUALITY CONTROL

- A. Provide testing of imported topsoil.
- B. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination.
- C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared subsoil and planters are ready to receive work.
- B. Saturate soil with water to test drainage.

3.02 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to a depth of 3 inches (75 mm) where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- D. Dig pits and beds 6 inches (150 mm) larger than plant root system.

3.03 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 4 inches (100 mm) over area to be planted. Rake smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches (150 mm).

3.04 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after initial raking of topsoil.
- C. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- D. Lightly water to aid the dissipation of fertilizer.

3.05 PLANTING

- A. Set plants vertical.
- B. Remove non-biodegradable root containers.
- C. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches (of 150 mm) under each plant. Remove burlap, ropes, and wires, from the root ball.
- D. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch (150 mm) layers. Maintain plant life in vertical position.
- E. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.06 PLANT SUPPORT

- A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
 - 1. Tree Caliper: 1 inch (25 mm); Tree Support Method: 1 stake with one tie
 - 2. Tree Caliper: 1 to 2 inches (25 to 50 mm); Tree Support Method: 2 stakes with two ties
 - 3. Tree Caliper: 2 to 4 inches (50 to 100 mm); Tree Support Method: 3 guy wires with eye bolts and turn buckles
 - 4. Tree Caliper: Over 4 inches (100 mm); Tree Support Method: 4 guy wires with eye bolts and turn buckles

3.07 TREE PRUNING

- A. Prune trees as recommended in ANSI A300 Part 1.
- B. Prune newly planted trees as required to remove dead, broken, and split branches.

3.08 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.09 MAINTENANCE

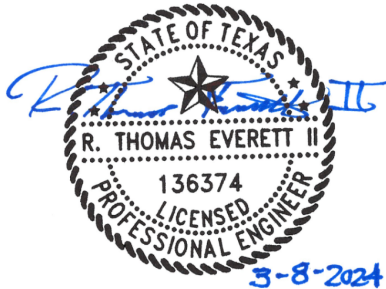
- A. See Section 32 01 90 - Operation and Maintenance of Planting for post-occupancy maintenance.

END OF SECTION

Community Center Park Expansion

Civil Engineering Technical Specifications

100% BID SET



711 N. Carancahua Street
Suite 1190
Corpus Christi, Texas 78401
P: (361) 400-4600
TPBE Firm# F-312

DIVISION 2 – SITEWORK

021 SITE PREPARATION

021 020.....Site Clearing and Stripping

021 040.....Site Grading

022 EARTHWORK

022 020.....Excavation and Backfill for Utilities

022 021.....Control of Groundwater

022 022.....Trench and Safety for Excavations

022 100.....Select Material

022 420.....Silt Fence

025 ROADWAY

025 404.....Asphalt Oils and Emulsions

025 412.....Prime Coat

025 424.....Hot Mix Asphalt Concrete Pavement

025 608.....Inlets

025 610.....Concrete Curb and Gutter

025 612.....Concrete Sidewalks and Driveways

025 620.....Portland Cement Concrete Pavement

025 802.....Temporary Traffic Controls During
Construction

025 807.....Pavement Markings (Paint and
Thermoplastic)

025 813.....Preformed Thermoplastic Striping, Words,
and Emblems

027 WASTEWATER & STORM WATER

027 402.....Reinforced Concrete Pipe Culverts

DIVISION 3 – CONCRETE

030 020.....Portland Cement Concrete

032 020.....Reinforcing Steel

038 000.....Concrete Structures

DIVISION 5 – METALS

055 420.....Frames, Grates, Rings, & Covers

TXDOT – Specification Item

**506.....Temporary Erosion, Sedimentation, and
Environmental Controls**

SECTION 021020
SITE CLEARING AND STRIPPING

1. DESCRIPTION

This specification shall govern all work necessary for clearing, grubbing and stripping of objectionable matter as required to complete the project, and shall include removing and disposing of trees, stumps, brush, roots, vegetation, rubbish and other objectionable matter from the project site.

2. CONSTRUCTION METHODS

The site shall be cleared of all trees, stumps, brush, roots, vegetation, rubbish and other objectionable matter as indicated on the drawings and/or as directed by the Engineer or his designated representative. Tree stumps and roots shall be grubbed to a minimum depth of 2 feet below natural ground or 2 feet below base of subgrade, whichever is lower. Areas that underlie compacted backfill shall be stripped of all vegetation, humus and other objectionable matter encountered within the top six (6) inches of the soil. All material removed from the site under this operation shall become the Contractor's responsibility. The material shall be disposed of either at a disposal site indicated on the drawings or at a disposal site obtained by the Contractor.

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, site clearing and stripping or clear right-of-way shall be measured by the acre.

Payment shall be full compensation for all labor, equipment, tools and incidentals necessary for removing, handling, and disposing of objectionable matter from the site as indicated above.

SECTION 021040
SITE GRADING

1. DESCRIPTION

This specification shall govern all work necessary for backfill and grading of the site to complete the project.

2. CONSTRUCTION METHODS

Prior to site grading, the site shall be cleared in accordance with City Standard Specification Section 021020 "Site Clearing and Stripping". Unless specified otherwise on the drawings, the existing surface shall be loosened by scarifying or plowing to a depth of not less than six (6) inches.

The loosened material shall be recompacted with fill required to bring the site to the required grades and elevations indicated on the plans.

Fill shall be uniform as to material, density and moisture content. Fill shall be free of large clods, large rocks, organic matter, and other objectionable material. No fill that is placed by dumping in a pile or windrow shall be incorporated into a layer in that position; all such piles and windrows shall be moved by blading or similar method. All fill shall be placed in layers approximately parallel to the finish grade in layers not to exceed six (6) inches of uncompacted depth, unless indicated otherwise on drawings.

The fill shall be compacted to a density which approximates that of natural ground unless indicated otherwise on drawings.

The Engineer may order proof rolling to test the uniformity of compaction. All irregularities, depressions and soft spots that develop shall be corrected by the Contractor.

Excess material from excavation, which is not incorporated into the site as fill, shall become property of the Contractor and disposed of away from the job site, unless indicated otherwise on the drawings.

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, site grading shall not be measured for pay, but shall be considered subsidiary to other work.

SECTION 022020
EXCAVATION AND BACKFILL FOR UTILITIES

1. DESCRIPTION

This specification shall govern all work for excavation and backfill for utilities required to complete the project.

2. CONSTRUCTION

- (1) Unless otherwise specified on the drawings or permitted by the Engineer, all pipe and conduit shall be constructed in open cut trenches with vertical sides. Trenches shall be sheathed and braced as necessary throughout the construction period. Sheathing and bracing shall be the responsibility of the Contractor (refer to Section 022022 "Trench Safety for Excavations" of the City Standard Specifications).

Trenches shall have a maximum width of one foot beyond the horizontal projection of the outside surfaces of the pipe and parallel thereto on each side unless otherwise specified.

The Contractor shall not have more than 200 feet of open trench left behind the trenching operation and no more than 500 feet of ditch behind the ditching machine that is not compacted as required by the plans and specifications. No trench or excavation shall remain open after working hours.

For all utility conduit and sewer pipe to be constructed in fill above natural ground, the embankment shall first be constructed to an elevation not less than one foot above the top of the pipe or conduit, after which excavation for the pipe or conduit shall be made.

If quicksand, muck, or similar unstable material is encountered during the excavation, the following procedure shall be used unless other methods are called for on the drawings. If the unstable condition is a result of ground water, the Contractor, prior to additional excavation, shall control it. After stable conditions have been achieved, unstable soil shall be removed or stabilized to a depth of 2 feet below the bottom of pipe for pipes 2 feet or more in height; and to a depth equal to the height of pipe, 6 inches minimum, for pipes less than 2 feet in height. Such excavation shall be carried at least one foot beyond the horizontal limits of the structure on all sides. All unstable soil so removed shall be replaced with suitable stable material, placed in uniform layers of suitable depth as directed by the Engineer, and each layer shall be wetted, if necessary, and compacted by mechanical tamping as required to provide a stable condition. For unstable trench conditions requiring outside forms, seals, sheathing and bracing, any additional excavation and backfill required shall be done at the Contractor's expense.

- (2) Shaping of Trench Bottom. The trench bottom shall be undercut a minimum depth sufficient to accommodate the class of bedding indicated on the plans and specifications.

- (3) Dewatering Trench. Pipe or conduit shall not be constructed or laid in a trench in the presence of water. All water shall be removed from the trench sufficiently prior to the pipe or conduit planing operation to insure a relatively dry (no standing water), firm bed. The trench shall be maintained in such dewatered condition until the trench has been backfilled to a height at least one foot above the top of pipe. Removal of water may be accomplished by bailing, pumping, or by installation of well-points, as conditions warrant. Removal of well-points shall be at rate of 1/3 per 24 hours (every third well-point). The Contractor shall prevent groundwater from trench or excavation dewatering operations from discharging directly into the storm water system. Groundwater from dewatering operations shall be sampled and tested, if applicable, and disposed of, in accordance with City Standard Specification Section 022021 "Control of Ground Water".
- (4) Excavation in Streets. Excavation in streets, together with the maintenance of traffic where specified, and the restoration of the pavement riding surface, shall be in accordance with drawing detail or as required by other applicable specifications.
- (5) Removing Abandoned Structures. When abandoned masonry structures or foundations are encountered in the excavation, such obstructions shall be removed for the full width of the trench and to a depth one foot below the bottom of the trench. When abandoned inlets or manholes are encountered and no plan provision is made for adjustment or connection to the new utility, such manholes and inlets shall be removed completely to a depth one foot below the bottom of the trench. In each instance, the bottom to the trench shall be restored to grade by backfilling and compacting by the methods provided hereinafter for backfill. Where the trench cuts through utility lines which are known to be abandoned, these lines shall be cut flush with the sides of the trench and blocked with a concrete plug in a manner satisfactory to the Engineer.
- (6) Protection of Utilities. The Contractor shall conduct his work such that a reasonable minimum of disturbance to existing utilities will result. Particular care shall be exercised to avoid the cutting or breakage of water and gas lines. Such lines, if broken, shall be restored promptly by the Contractor. When active wastewater lines are cut in the trenching operations, temporary flumes shall be provided across the trench while open, and the lines shall be restored when the backfilling has progressed to the original bedding line of the sewer so cut.

The Contractor shall inform utility owners sufficiently in advance of the Contractor's operations to enable such utility owners to reroute, provide temporary detours, or to make other adjustments to utility lines in order that the Contractor may proceed with his work with a minimum of delay. The Contractor shall not hold the City liable for any expense due to delay or additional work because of utility adjustments or conflicts.

- (7) Excess Excavated Material. All materials from excavation not required for backfilling the trench shall be removed by the Contractor from the job site promptly following the completion of work involved.

(8) Backfill

A. Backfill Procedure Around Pipe (Initial Backfill)

All trenches and excavation shall be backfilled as soon as is practical after the pipes or conduits are properly laid. In addition to the specified pipe bedding material, the backfill around the pipe as applicable shall be granular material as shown on the standard details or as described in the applicable specification section, and shall be free of large hard lumps or other debris. If indicated on the plans, pipe shall be encased with cement-stabilized sand backfill as described below. The backfill shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench, in layers not to exceed ten (10) inches (loose measurement), wetted if required to obtain proper compaction, and thoroughly compacted by use of mechanical tampers to a density comparable to the adjacent undisturbed soil or as otherwise specified on the plans, but not less than 95% Standard Proctor density. A thoroughly compacted material shall be in place between the external wall of the pipe and the undisturbed sides of the trench and to a level twelve (12) inches above the top of the pipe.

B. Backfill Over One Foot Above Pipe (Final Backfill)

UNPAVED AREAS: The backfill for that portion of trench over one (1) foot above the pipe or conduit not located under pavements (including waterlines, gravity wastewater lines, wastewater force mains and reinforced concrete storm water pipe) shall be imported select material or clean, excess material from the excavation meeting the following requirements:

- Free of hard lumps, rock fragments, or other debris,
- No clay lumps greater than 2" diameter
- Moisture Content: +/-3%

Backfill material shall be placed in layers not more than ten (10) inches in depth (loose measurement), wetted if required to obtain proper compaction, and thoroughly compacted by use of mechanical tampers to the natural bank density but not less than 95% Standard Proctor density, unless otherwise indicated. Flooding of backfill is not allowed. Jetting of backfill may only be allowed in sandy soils and in soils otherwise approved by the Engineer. Regardless of backfill method, no lift shall exceed 10 inches and density shall not be less than 95% Standard Proctor density. A period of not less than twenty-four (24) hours shall elapse between the time of jetting and the placing of the top four (4) feet of backfill. If jetting is used, the top four (4) feet of backfill shall be placed in layers not more than 10 inches in depth (loose measurement), wetted if required to obtain proper compaction, and thoroughly compacted by use of mechanical tampers to the natural bank density but not less than 95% Standard Proctor density (ASTM D698).

PAVED AREAS: At utility line crossings under pavements (including waterlines, gravity wastewater lines, wastewater force mains, and reinforced concrete storm water pipe), and where otherwise indicated on the drawings, trenches shall be backfilled as shown below:

From top of initial backfill (typically twelve (12) inches above top of the pipe) to three (3) feet below bottom of road base course, backfill shall be select material meeting the requirements of 022100 "Select Material".

Asphalt Roadways

The upper three (3) feet of trench below the road base course shall be backfilled to the bottom of the road base course with cement-stabilized sand containing a minimum of 2 sacks of Standard Type I Portland cement per cubic yard of sand and compacted to not less than 95% Standard Proctor density.

Concrete Roadways

The Contractor may elect to backfill the upper three (3) feet of trench below the road base course with cement stabilized sand as noted above, or in the case of storm water pipe or box installation the Contractor may backfill and compact select material to 98% Standard Proctor density (ASTM D698) following City Standard Specification Section 022100.

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, excavation and backfill for utilities, including select material or cement-stabilized sand backfill, shall not be measured and paid for separately. It shall be considered subsidiary to the items for which the excavation and backfill is required.

SECTION 022021
CONTROL OF GROUND WATER

1. GENERAL

1.1 SECTION INCLUDES

- A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.
- B. Protection of excavations and trenches from surface runoff.
- C. Disposing of removed ground water by approved methods.

1.2 REFERENCES

- A. ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.
- B. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
- C. Federal Register 40 CFR (Vol. 55, No. 222) Part 122, EPA Administered Permit Programs (NPDES), Para.122.26(b)(14) Storm Water Discharge.

1.3 DEFINITIONS

- A. Ground water control includes both dewatering and depressurization of water-bearing soil layers.
 - 1. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts, and disposing of removed ground water by approved methods. The intent of dewatering is to increase the stability of tunnel excavations and excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure or heaving of the bottom of excavations; and to provide suitable conditions for placement of backfill materials and construction of structures, piping and other installations.
 - 2. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom or instability of tunnel excavations.
- B. Excavation drainage includes keeping excavations free of surface and seepage water.

- C. Surface drainage includes the use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the Work from any source of surface water.
- D. Equipment and instrumentation for monitoring and control of the ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.

1.4 PERFORMANCE REQUIREMENTS

- A. Conduct subsurface investigations as needed to identify ground water conditions and to provide parameters for design, installation, and operation of ground water control systems.
- B. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and City Standard Specification Section 022022 - Trench Safety for Excavations, to produce the following results:
 - 1. Effectively reduce the hydrostatic pressure affecting:
 - a) Excavations (including utility trenches);
 - b) Tunnel excavation, face stability or seepage into tunnels.
 - 2. Develop a substantially dry and stable subgrade for subsequent construction operations.
 - 3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
 - 4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
 - 5. Maintain stability of sides and bottom of excavations.
- C. Provide ground water control systems which may include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.
- D. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.
- E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water away from excavations.
- F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

- G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures, and any settlement or resultant damage caused by the ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.
- H. Provide an adequate number of piezometers installed at the proper locations and depths as required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.
- I. Provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.
- J. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use, if applicable.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Comply with requirements of agencies having jurisdiction.
- B. Comply with Texas Commission on Environmental Quality (TCEQ) regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
- C. Prior to beginning construction activities, file Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the Texas Pollutant Elimination System (TPDES) General Permit No. TXR150000, administered by the Texas Commission on Environmental Quality (TCEQ). The general permit falls under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code.
- D. Prepare submittal form and submit to TCEQ along with application fee.
- E. Upon completion of construction, file Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES General Permit with the TCEQ.
- F. Obtain all necessary permits from agencies with control over the use of ground water and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.
- G. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

- H. Conduct sampling and testing of ground water and receiving waters as outlined in Article 3 below.

2. PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering.
- B. Eductors, well points, or deep wells, where used, shall be furnished, installed and operated by an experienced contractor regularly engaged in ground water control system design, installation, and operation.
- C. All equipment must be in good repair and operating order.
- D. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

3. EXECUTION

3.1 GROUND WATER CONTROL

- A. Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine the drawdown characteristics of the water bearing layers.
- B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.
- C. Install, operate, and maintain ground water control systems in accordance with the ground water control system design. Notify the City's Construction Inspector in writing of any changes made to accommodate field conditions and changes to the Work. Revise the ground water control system design to reflect field changes.
- D. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
- E. Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.
- F. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed

works. Allowable piezometric elevations shall be defined in the ground water control system design.

G. Remove ground water control installations.

1. Remove pumping system components and piping when ground water control is no longer required.
2. Remove piezometers and monitoring wells when directed by the City Engineer.
3. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

H. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hour after placement.

I. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.

J. Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such as for units designed to withstand hydrostatic uplift pressure. Provide a means for draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.

K. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.

L. In unpaved areas, compact backfill to not less than 95 percent of Standard Proctor maximum dry density in accordance with ASTM D 698. In paved areas (or areas to receive paving), compact backfill to not less than 98 percent of Standard Proctor maximum dry density in accordance with ASTM D 698.

3.2 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For above ground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.

B. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are pre-drained prior to excavation. Provide separate piezometers for

monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.

- C. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation (including trenching).
- D. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is pre-drained by an existing system such that the criteria of the ground water control system design are satisfied.
- E. Replace installations that produce noticeable amounts of sediments after development.
- F. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control system design do not provide satisfactory results based on the performance criteria defined by the ground water control system design and by these specifications.

3.3 EXCAVATION DRAINAGE

- A. Contractor may use excavation drainage methods if necessary to achieve well drained conditions. The excavation drainage may consist of a layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

3.4 MAINTENANCE AND OBSERVATION

- A. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area or seepage into tunnel is occurring. Keep system in good condition.
- B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
- C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.
- D. Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the City Engineer.

3.5 MONITORING AND RECORDING

- A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved, and twice weekly thereafter.

- B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when City Engineer determines that more frequent monitoring and recording are required. Comply with Construction Inspector's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

3.6 SAMPLING, TESTING AND DISPOSAL OF GROUND WATER

- A. It is the intent that the Contractor discharge groundwater primarily into the existing storm water system in accordance with City Ordinance, Article XVI, Section 55-203, *only* if the groundwater is uncontaminated and the quality of the ground water is equal to or better than the quality of the receiving stream.
- B. The Contractor shall prevent ground water from trench or excavation dewatering operations from discharging directly into the storm water system prior to testing and authorization. Ground water from dewatering operations shall be sampled and tested, and disposed of by approved methods.
- C. Laboratory analysis of groundwater and receiving water quality is to be performed by the Contractor at the Contractor's expense, prior to commencing discharge, and groundwater analysis shall be performed by the Contractor at a minimum of once per week. Contractor shall coordinate with the City Storm Water Department on all laboratory analysis. Laboratory analysis of groundwater shall also be performed at each new area of construction prior to discharge from that location.
- D. Sample containers, holding times, preservation methods, and analytical methods, shall either follow the requirements in 40 CFR Part 136 (as amended), or the latest edition of "Standard Methods for the Examination of Water and Wastewater." Any laboratory providing analysis must be accredited or certified by the Texas Commission on Environmental Quality according to Title 30 Texas Administrative Code (30 TAC) Chapters 25 for the matrices, methods, and parameters of analysis, if available, or be exempt according to 30 TAC §25.6.
- E. Analysis of the ground water discharge shall show it to be equal to or better than the quality of the first natural body of receiving water. This requires testing of both the receiving water and a sample of the ground water. All parts of this procedure shall be complete prior to any discharge of ground water to the storm water system.
- F. Steps to Determine Legitimate Discharge:
 - 1. Identify the First Receiving Water.
 - a) When the first body of water is a fresh water system (Nueces River or Oso Creek), the analysis typically fails because the local ground water will likely be too high in Total Dissolved Solids (TDS). In the case of a perched aquifer, the ground water may turn out fairly fresh, but local experience shows this to be unlikely.
 - b) If the receiving water is a marine environment, proceed with Step 2 below to compare the ground water quality to receiving water quality.

2. Compare Ground Water Discharge Quality to Receiving Water Quality.

The following table, Ground Water Discharge Limits, indicates that the parameters to compare to the receiving water are Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). If the ground water results are equal to or better than the receiving water, then the discharge may be authorized as long as the discharge does not exceed the other parameters which would indicate hydrocarbon contamination. Note that the receiving water only needs to be tested initially as a baseline and the ground water shall be tested weekly to ensure compliance.

GROUND WATER DISCHARGE LIMITS

Parameter	Ground Water Monitoring Frequency	Receiving Water Monitoring Frequency	Maximum Limitation
Total Dissolved Solids (TDS)	Initial + Weekly	Once Prior to Discharge	< Receiving Water
Total Suspended Solids (TSS)	Initial + Weekly	Once Prior to Discharge	< Receiving Water
Total Petroleum Hydrocarbons	Initial + Weekly		15 mg/L
Total Lead	Initial + Weekly		0.1 mg/L
Benzene	Initial + Weekly		0.005 mg/L
Total BTEX	Initial + Weekly		0.1 mg/L
Polynuclear Aromatic Hydrocarbons	Initial + Monthly		0.01 mg/L

3. Analyze Ground Water for Hydrocarbon Contamination.

All other parameters listed on the Ground Water Discharge Limits table must be analyzed prior to ground water discharge to the storm water system. If no limits are exceeded, ground water discharge to the storm water system may be authorized following notification to the MS4 operator (City of Corpus Christi) and all Pollution Prevention Measures for the project are in place. Analytical results shall be on-site or readily available for review by local, state or federal inspectors. Note that this step is frequently done simultaneously with Step 2 above to shorten analytical processing time.

4. Pollution Prevention Measures.

A storm water pollution prevention plan or pollution control plan shall be developed and implemented prior to any ground water discharges to the storm water system. The plan's objectives are to limit erosion and scour of the storm water system, and minimize Total Suspended Solids (TSS) and other forms of contamination, and prevent any damage to the storm water system. Note that ground water discharges must cease immediately upon the first recognition of contamination, either by sensory or analytical methods. If the discharge of groundwater results in any damages to the storm water system, the responsible party

shall remediate any damage to the storm water system and the environment to the satisfaction of the Storm Water Department and/or any State or Federal Regulatory Agency.

5. MS4 Operator Notification.

The MS4 operator shall be notified prior to ground water discharge to the storm water system. Contractor shall contact the designated City MS4 representative to request authorization to discharge ground water to the storm water system.

Notification shall include:

Project Name:

Responsible Party:

Discharge Location:

Receiving Water:

Estimated Time of Discharge:

Linear Project: Yes / No

Pollution Prevention Measures Implemented:

Statement indicating all sampling and testing has been conducted and meets the requirements of a legitimate discharge.

G. Discharges to Wastewater System

In the event that the groundwater does not equal or exceed the receiving water quality, an alternative disposal option would include pumping to the nearest sanitary sewer system. Discharge to the sanitary sewer system requires a permit from the Wastewater Department. If discharging to temporary holding tanks and trucking to a sanitary sewer or wastewater treatment plant, the costs for these operations shall be negotiated.

Contractor shall contact the Pretreatment Group for City Utility Operations to obtain a Wastewater Discharge Permit Application for authorization to discharge to the wastewater system. Authorization approval will include review of laboratory analysis of the ground water and estimated flow data. Note that groundwater discharges must cease immediately upon the first recognition of contamination, either by sensory or analytical methods. If the discharge of groundwater results in any damages to the wastewater collection system or wastewater overflows, the responsible party shall remediate any damage to the wastewater collection system and the environment to the satisfaction of the Wastewater Department and/or any State or Federal Regulatory Agency.

- H. Other groundwater disposal alternatives or solutions may be approved by the Engineer on a case by case basis.

3.7 SURFACE WATER CONTROL

- A. Intercept surface water and divert it away from excavations through the use of dikes, ditches, curb walls, pipes, sumps or other approved means.
- B. Divert surface water into sumps and pump into drainage channels or storm drains, when

approved by the City Engineer. Provide settling basins when required by the City Engineer.

- C. Storm water that enters the excavation can be pumped out as long as care is taken to minimize solids and mud entering the pump suction and flow is pumped to a location that allows for sheet flow prior to entering a storm water drainage ditch or storm water inlet. An alternative to sheet flow is to pump storm water to an area where ponding occurs naturally without leaving the designated work area or by manmade berm(s) prior to entering the storm water system. Sheet flow and ponding is required to allow solids screening and/or settling prior to entering the storm water system. Storm water or groundwater shall not be discharged to private property.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, control of ground water will not be measured and paid for separately, but shall be considered subsidiary to other bid items.

SECTION 022022
TRENCH SAFETY FOR EXCAVATIONS

1. DESCRIPTION

This specification shall govern all work for providing for worker safety in excavations and trenching operations required to complete the project.

2. REQUIREMENTS

Worker Safety in excavations and trenches shall be provided by the Contractor in accordance with Occupational Safety and Health Administration (OSHA) Standards, 29 CFR Part 1926 Subpart P - Excavations.

It is the sole responsibility of the Contractor, and not the City or Engineer or Consultant, to determine and monitor the specific applicability of a safety system to the field conditions to be encountered on the job site during the project.

The Contractor shall indemnify and hold harmless the City and Engineer and Consultant from all damages and costs that may result from failure of methods or equipment used by the Contractor to provide for worker safety.

Trenches, as used herein, shall apply to any excavation into which structures, utilities, or sewers are placed regardless of depth.

Trench Safety Plan, as used herein, shall apply to all methods and materials used to provide for worker safety in excavation and trenching operations required during the project.

3. MEASUREMENT AND PAYMENT

Measurement of Trench Safety shall be by the linear foot of trench, regardless of depth. Measurement shall be taken along the centerline of the trench.

Measurement for Excavation Safety for Utility Structures shall be per each excavation. Excavations include, but are not limited to, those for manholes, vaults, pits and other such structures that are incidental to utility work.

Measurement for Excavation Safety for Special Structures shall be per each excavation or by the lump sum for each special structure identified in the Proposal.

Payment shall be at the unit price bid and shall fully compensate the Contractor for all work, equipment, materials, personnel, and incidentals as required to provide for worker safety in trenches and excavations for the project.

Revision current for Texas Code Chapter 756 Subchapter C. Trench Safety.

SECTION 022100
SELECT MATERIAL

1. DESCRIPTION

This specification shall govern the use of Select Material to be used to treat designated sections of roadways, embankments, trenches, and general fill, etc. Select material shall conform to the requirements outlined within the Geotechnical Engineering Report-Earthwork section.

2. CONSTRUCTION METHODS

Select material shall be mixed uniformly and placed in layers as indicated in the Geotechnical Engineering Report-Earthwork section. Unless otherwise specified, the material shall be compacted to a minimum of 95% Standard Proctor density. Each layer shall be complete before the succeeding layer is placed.

The finished surface of the select material shall conform to the grade and section shown on the drawings.

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, select material shall not be measured for pay, but shall be subsidiary to the appropriate bid item.

SECTION 022420
SILT FENCE

1. DESCRIPTION

This specification shall govern all work necessary for providing and installing silt fencing required to control sedimentation and erosion during construction of the project.

2. MATERIAL REQUIREMENTS

- A. Geotextile shall meet the requirements for temporary silt fence per AASHTO M288.
- B. Fence Reinforcement Materials:

Silt fence reinforcement shall be one of the following systems.

Type 1: Self-Supported Fence - This system consists of fence posts, spaced no more than 8-1/2 feet apart, and geotextile without net reinforcement. Fence posts shall be a minimum of 42 inches long, embedded at least one (1) foot into the ground, and constructed of either wood or steel. Soft wood posts shall be at least 3 inches in diameter or nominal 2 x 4 inches in cross section and essentially straight. Hardwood posts shall be a minimum of 1.5 x 1.5 inches in cross section. Fabric attachment may be by staples or locking plastic ties at least every 6 inches, or by sewn vertical pockets. Steel posts shall be T or L shaped with a minimum weight of 1.3 pounds per foot. Attachment shall be by pockets or by plastic ties if the posts have suitable projections.

Type 2: Net-Reinforced Fence - This system consists of fence posts, spaced no more than 8-1/2 feet apart, and geotextile with an attached reinforcing net. Fence posts shall meet the requirements of Self-Supported Fence. Net reinforcement shall be galvanized welded wire mesh of at least 12.5-gauge wire with maximum opening size of 4 x 2 inches. The fabric shall be attached to the top of the net by crimping or cord at least every 2 feet, or as otherwise specified.

Type 3: Triangular Filter Dike - This system consists of a rigid wire mesh, at least 6-gauge, formed into an equilateral triangle cross-sectional shape with sides measuring 18 inches, wrapped with geotextile silt fence fabric. The fabric shall be continuously wrapped around the dike, with a skirt extending at least 12 inches from its upslope corner.

- C. Packaging Requirements: Prior to installation, the fabric shall be protected from damage due to ultraviolet light and moisture by either wrappers or inside storage.

D. Certification and Identification: Each lot or shipment shall be accompanied by a certification of conformance to this specification. The shipment must be identified by a ticket or by labels securely affixed to the fabric rolls. This ticket or label must list the following information:

- a. Name of manufacturer or supplier
- b. Brand name and style
- c. Manufacturer's lot number or control number
- d. Roll size (length and width)
- e. Chemical composition

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, silt fence shall be measured by the linear foot. Payment shall be at the bid price for the unit of measurement specified and shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work. Payment shall include, but not be limited to, placing, maintaining and removing the silt fence.

SECTION 025404
ASPHALTS, OILS AND EMULSIONS

1. DESCRIPTION

This specification shall govern all work for asphalt cement, cut-back and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphaltic materials required to complete the project.

2. MATERIALS

When tested according to Texas Department of Transportation Test Methods, the various materials shall meet the applicable requirements of TxDOT Specification Item 300, “Asphalts, Oils, and Emulsions” (Latest Edition).

3. STORAGE, HEATING AND APPLICATION TEMPERATURES

Store and apply asphaltic materials in accordance with TxDOT Item 300 (Latest Edition) at the lowest temperature yielding satisfactory results. Follow the manufacturer’s instructions for any agitation requirements in storage and in application and storage temperatures.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, asphalts, oils and emulsions shall not be measured and paid for separately, but shall be considered subsidiary to the appropriate bid item.

SECTION 025412
PRIME COAT

1. DESCRIPTION

This specification shall consist of an application of asphalt material on the completed base course and/or other approved area in accordance with this specification.

Prime Coat shall not be applied when the air temperature is below 60° F and falling, but it may be applied when the air temperature is above 50° F and is rising; the air temperature being taken in the shade and away from artificial heat. Asphalt material shall not be placed when general weather conditions, in the opinion of the Engineer, are not suitable.

2. MATERIALS

The asphalt material used for the prime coat shall be MC-30 medium-curing cutback asphalt or AE-P asphalt emulsion prime, unless otherwise specified, and when tested by approved laboratory methods shall meet the requirements of City Standard Specification Section 025404 "Asphalts, Oils and Emulsions". Blotter material shall be native sand.

3. CONSTRUCTION METHODS

When, in the opinion of the Engineer, the area and/or base is satisfactory to receive the prime coat, the surface shall be cleaned of dirt, dust, and other deleterious matter by sweeping or other approved methods. If found necessary by the Engineer, the surface shall be lightly sprinkled with water just prior to application of the asphalt material. The asphalt material shall be applied on the clean surface by an approved type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution. The Contractor shall provide all necessary facilities for determining the temperature of the asphalt material in all of the heating equipment and in the distributor, for determining the rate at which it is applied, and for securing uniformity at the junction of two distributor loads.

All storage tanks, piping, retorts, booster tanks and distributors used in storing or handling asphalt material shall be kept clean and in good operating condition at all times, and they shall be operated in such manner that there will be no contamination of the asphalt material with foreign material. It shall be the responsibility of the Contractor to provide and maintain in good working order a recording thermometer at the storage-heating unit at all times. The distributor shall have been recently calibrated and the Engineer shall be furnished an accurate and satisfactory record of such calibration. After beginning of the work, should the yield on the asphalt material applied appear to be in error, the distributor shall be calibrated in a manner satisfactory to the Engineer before proceeding with the work.

Prime shall be applied at a temperature within the recommended range per City Standard

Specification Section 025404 "Asphalts, Oils and Emulsions", with that range being 70 to 150 degrees F. Application rate shall be not less than 0.15 gallon per square yard, unless otherwise specified.

The Contractor shall be responsible for the maintenance of the surface until the Engineer accepts the work.

No traffic hauling or placement of any subsequent courses shall be permitted over the freshly applied prime coat until authorized by the Engineer. Spread blotter material before allowing traffic to use a primed surface.

Allow sufficient time for the prime coat to cure properly before applying surface treatment or asphaltic concrete pavement.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, prime coat shall be measured by the gallon of asphalt material applied. Payment shall include furnishing, heating, hauling and distributing the asphalt material as specified; for furnishing, spreading and removing sand blotter material; for all freight involved; and for all manipulation, labor, materials, tools, equipment and incidentals necessary to complete the work.

SECTION 025424
HOT MIX ASPHALTIC CONCRETE PAVEMENT

1. DESCRIPTION

This specification shall govern all work required for furnishing and laying Hot Mix Asphalt Concrete (HMAC) surface, binder and base courses required to complete the project.

All subsurface utilities must be inspected, tested, and accepted prior to any paving.

Hot mix asphaltic concrete pavement shall conform to the requirements outlined within the Geotechnical Engineering Report-Pavements section and 2014 TXDOT Standard Specifications.

2. MATERIALS, PAVEMENT MIXTURE, AND TESTING

The asphaltic concrete surface course should be plant mixed, hot laid Type C or D Surface. The asphaltic concrete base course should be plant mixed, hot laid Type A or B Base. Each mix should meet the master specifications requirements of 2014 TXDOT Standard Specification Item 340 or applicable special specifications SS3076 and SS3077, and specific criteria for the job mix formula. The mix should be compacted between 91 and 95 percent of the maximum theoretical density as measured by TEX-227-F. The asphalt cement content by percent of total mixture weight should fall within a tolerance of ± 0.3 percent asphalt cement from the specific mix. In addition, the mix should be designed so 75 to 85 percent of the voids in the mineral aggregate (VMA) are filled with asphalt cement. The grade of the asphalt cement should be PG 70-22 or higher performance grade. Aggregates known to be prone to stripping should not be used in the hot mix. If such aggregates are used measures should be taken to mitigate this concern. The mix should have at least 70 percent strength retention when tested in accordance with TEX-531-C.

Pavement specimens, which shall be either cores or sections of asphaltic pavement, will be tested according to Test Method TEX-207-F. The nuclear-density gauge or other methods which correlate satisfactorily with results obtained from project pavement specimens may be used when approved by the Engineer. Unless otherwise shown on the plans, the Contractor shall be responsible for obtaining the required pavement specimens at their expense and in a manner and at locations selected by the Engineer.

3. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, hot mix asphaltic concrete pavement shall be measured by the square yard of the type and thickness of "Hot Mix Asphaltic Concrete" as shown on the drawings.

The Contractor shall provide the Engineer with copies of the "pay ticket" identifying the truck and showing the gross empty weight of the truck with driver as it arrives at the plant and the gross loaded weight of the truck with driver as it leaves the plant. The measured

amount will be the difference of the loaded and empty trucks converted to tons.

Payment shall be full compensation for quarrying, furnishing all materials, freight involved; for all heating, mixing, hauling, cleaning the existing base course or pavement, tack coat, placing asphaltic concrete mixture, rolling and finishing; and for all manipulations, labor, tools, equipment, and incidentals necessary to complete the work except prime coat when required.

Prime coat, performed where required, will be measured and paid for in accordance with the provisions governing City Standard Specification Section 025412 "Prime Coat".

All templates, straightedges, scales, and other weight and measuring devices necessary for the proper construction, measuring and checking of the work shall be furnished, operated and maintained by the Contractor at their expense.

Any paving placed prior to inspection, testing, and acceptance of underground utilities may be rejected by the City and will be replaced at the Contractor's expense after correcting any subsurface utility defects. Pavement that fails to meet the in place density criteria may be rejected by the City and will be replaced at the Contractor's expense, or such pavement may, at the City's discretion, be accepted by the City and the unit price for payment shall be reduced as deemed appropriate by the Engineer.

SECTION 025608
INLETS

1. DESCRIPTION

This specification shall govern for the construction of inlets complete in place and the materials used therein, including the installation, and the furnishing of frames, grates, rings and covers.

2. TYPES

The various types of inlets are designated on the drawings by letters or by numbers indicating the particular design of each. Each type shall be constructed in accordance with the details shown on the drawings and to the depth required by the profiles and schedules given.

3. MATERIALS

- (1) Concrete. Concrete for curb inlets shall be Class "A" concrete conforming to the requirements of City Standard Specification Section 038000 "Concrete Structures", and City Standard Specification Section 030020 "Portland Cement Concrete", except as otherwise provided on the drawings. Concrete for grate inlets, drop inlets and post inlets shall be Class "C" concrete in accordance with City Standard Specification Section 030020 "Portland Cement Concrete".
- (2) Mortar. Mortar shall be composed of one part Portland cement and two parts clean, sharp mortar sand suitably graded for the purpose by conforming in other respects to the provisions of City Standard Specification Section 030020 "Portland Cement Concrete" for fine aggregate. Hydrated lime or lime putty may be added to the mix but in no case shall it exceed 10 percent by weight of the total dry mix.
- (3) Reinforcing Steel. Reinforcing Steel shall conform to the requirements of City Standard Specification Section 032020 "Reinforcing Steel".
- (4) Concrete Blocks. Concrete blocks, when shown on the drawings, shall conform to the requirements of ASTM C 139.
- (5) Frames, Grates, Rings and Covers. Frames, grates, rings and covers shall conform to the requirements of City Standard Specification Section 055420 "Frames, Grates, Rings and Covers".
- (6) Cast Iron. Cast iron for supports and inlet units shall conform to the shape and dimensions shown on the plans. The castings shall be clean and perfect, free from sand or blow holes or other defects. Cast iron castings shall conform to the requirements of "Gray Iron Castings" ASTM A 48, Class 30.

4. CONSTRUCTION METHODS

- (1) General. All concrete work shall be performed in accordance with the requirements of City Standard Specification Section 038000 "Concrete Structures", unless otherwise specified. Forms will be required for all concrete walls, except where the nature of the surrounding material is such that it can be trimmed to a smooth vertical face.
- (2) Inlets for Precast Concrete Pipe Sewers. The construction of inlets for precast concrete pipe sewers shall be done as soon as is practicable after sewer lines into or through inlet locations are completed. All sewers shall be cut neatly at the inside face of the walls of inlet and pointed up with mortar. Subgrade under cast-in-place and precast inlets shall be compacted to not less than 95% Standard Proctor density.
- (3) Inverts. The inverts passing out or through the inlet shall be shaped and routed across the floor of inlet as shown on the plans. This shaping may be accomplished by adding and shaping mortar or concrete after the base is cast or by placing the required additional material with the base.
- (4) Finishing Complete Inlets. Inlets shall be completed in accordance with the drawings. Backfilling to finish grade elevation with native material, free of debris and compacted to over 95% Standard Proctor density. Backfilling shall be in accordance with the provisions of City Standard Specification Section 022020 "Excavation and Backfill for Utilities".

5. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, inlets shall be measured as individual units by each inlet, complete in place.

Extension to inlets will be measured by each extension separately from the inlet.

Excavation, backfill, frames, grates, rings and covers will be considered subsidiary to the construction of the inlets.

Payments shall be full compensation for furnishing all concrete, reinforcing steel, mortar, castings, frames, grates, rings and covers, and for all other materials, labor, tools, equipment and incidentals required to perform the work prescribed above.

SECTION 025610
CONCRETE CURB AND GUTTER

1. DESCRIPTION

This specification shall consist of Portland cement concrete combined concrete curb and gutter or separate concrete curb with or without reinforcing steel as required, constructed on an approved subgrade or foundation material in accordance with these specifications, in conformity with the lines and grades established by the Engineer and details shown on the drawings.

2. MATERIALS

Unless otherwise specified on the drawings, materials and proportions for concrete used in construction under this specification shall conform to the requirements as specified for Class "A" Concrete under City Standard Specification Section 030020 "Portland Cement Concrete". Reinforcing steel shall conform to the requirements as specified in City Standard Specification Section 032020 "Reinforcing Steel". Expansion joint filler shall be redwood material meeting the requirements specified in City Standard Specification Section 038000 "Concrete Structures".

3. CONSTRUCTION METHODS

The foundation shall be excavated and shaped to line, grade and cross-section, and hand tamped and sprinkled. If dry, the subgrade or foundation material shall be sprinkled lightly with water and compacted to not less than 98% Standard Proctor density, or as required on the drawings. Flexible base shall be compacted to specified density and moisture immediately before concrete is deposited thereon.

Outside forms shall be of wood or metal, of a section satisfactory to the Engineer, straight, free of warp, and of a depth equal to the depth of the curb and gutter. They shall be securely staked to line and grade, and maintained in a true position during the depositing of concrete. Inside forms for the curb shall be approved material, shall be of such design as to provide the curb required, and shall be rigidly attached to the outside forms. For reinforced concrete roadways, all jointing must be reflected through the curb, including redwood expansion joints and construction joints. Driveway gutter shall be placed integrally with the driveway as shown on the City Standard Details.

The reinforcing steel shall be placed in position as shown on the typical details. Care shall be exercised to keep all reinforcing steel in its proper location.

Concrete for curb and gutter shall be mixed in a manner satisfactory to the Engineer. The curb and gutter shall be placed in sections of the length indicated on the plans, and each section shall be separated by a premolded insert or board joint of cross-section specified for the curb and gutter, and of the thickness indicated on the drawings.

After the concrete has been struck off and after it has become sufficiently set, the exposed surfaces shall be thoroughly worked with a wooden float. The exposed edges shall be rounded by the use of an edging tool to the radius indicated on the drawings. All exposed surfaces of curb and gutter, or curb, shall be brushed to a smooth and uniform surface.

The completed curb and gutter shall be cured with Type 2, white pigmented curing compound unless shown otherwise on the drawings. Other methods of curing as outlined in City Standard Specification Section 038000 "Concrete Structures" will be acceptable with a required curing period of 72 hours.

The area behind the curb shall be backfilled, tamped, and sloped as directed as soon as possible and no later than 48 hours after the removal of forms. Backfill shall be placed to the full height of the curb, or as otherwise specified.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, concrete curb and gutter or concrete curb will be measured by the linear foot for each type of curb, complete in place. Payment shall be full compensation for preparing the subgrade; for furnishing and placing all materials including reinforcing steel and expansion joint material; for furnishing, placing, shaping and tamping backfill; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 025612
CONCRETE SIDEWALKS AND DRIVEWAYS

1. DESCRIPTION

This specification shall consist of sidewalks and driveways, with or without reinforcing steel, composed of Portland cement concrete, constructed as herein specified on an approved subgrade, in conformity with the lines and grades established by the Engineer and the details shown on the drawings.

2. MATERIALS

Materials and proportions used in construction under this item shall conform to the requirements as specified for Class "A" concrete under City Standard Specification Section 030020 "Portland Cement Concrete". Reinforcing steel shall conform to the requirements as specified in City Standard Specification Section 032020 "Reinforcing Steel". Expansion joint filler shall be redwood meeting the requirements specified in City Standard Specification Section 038000 "Concrete Structures". Cap seal shall be "Greenstreak" or approved equal.

3. CONSTRUCTION METHODS

The subgrade shall be excavated, compacted and shaped to line, grade and cross-section and hand tamped and sprinkled with water. Subgrade under concrete sidewalks and driveways shall be moisture conditioned and compacted to not less than 95% Standard Proctor density. The subgrade shall be within -2 to +3% of optimum moisture content at the time the concrete is placed.

Forms shall be of wood or metal, of a section satisfactory to the Engineer, straight, 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 concrete.

The reinforcing steel shall be placed in position as shown on the drawings. Care shall be exercised to keep all reinforcing steel in its proper location.

Driveways shall incorporate the gutter in a unified concrete placement as shown in the City Standard Detail for driveways.

Sidewalks shall be constructed in sections of the lengths shown on drawings. Unless otherwise provided by the drawings, no section shall be of a length less than 8 feet, and any section less than 8 feet shall be removed by the Contractor at his own expense.

The different sections shall be separated by a premolded insert or board joint of the thickness shown on the drawings, placed vertically and at right angles to the longitudinal axis of the sidewalks. Where the sidewalk or driveways abut a curb or retaining wall, approved expansion joint material shall be placed along their entire length. Similar expansion joint material shall be placed around all obstructions protruding through sidewalks or driveways.

Concrete shall be mixed in a manner satisfactory to the Engineer, placed in the forms to the depth specified and spaded and tamped until thoroughly compacted and mortar entirely covers the surface. The top surface shall be floated with a wooden float to a gritty texture. The outer edges and joints shall then be rounded with approved tools to the radii shown on drawings.

5-foot wide sidewalks shall be marked into separate sections, each 5 feet in length, by the use of approved jointing tools. For other widths of sidewalk, joints to be spaced longitudinally to match the transverse width.

When completed, the sidewalks and driveways shall be cured with Type 2, white pigmented curing compound. Other methods of curing as outlined in City Standard Specification Section 038000 "Concrete Structures" will be acceptable with a required curing period of 72 hours.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, concrete sidewalks and driveways shall be measured by the square foot of surface area of completed sidewalks, driveways, or sidewalks and driveways, as indicated on the drawings.

Payment shall be full compensation for preparing and compacting the subgrade; for furnishing and placing all materials including concrete, reinforcing steel and expansion joint material; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 025620
PORTLAND CEMENT CONCRETE PAVEMENT

1. DESCRIPTION

This specification shall govern for the construction of Portland cement concrete pavement on a prepared subgrade or base course, in accordance with the typical sections shown on the drawings.

The concrete shall be composed of Portland cement, aggregates (fine and coarse), admixtures if desired or required, and water, proportioned and mixed as hereinafter provided.

All subsurface utilities must be inspected, tested, and accepted prior to any paving.

2. MATERIALS

(1) Cement

The cement shall be either Type I, Type II or Type III Portland cement conforming to ASTM Designation: C150, modified as follows:

Unless otherwise specified by the Engineer, the specific surface area of Type I and II cements shall not exceed 2000 square centimeters per gram (Wagner Turbidimeter – TxDOT Test Method Tex-310-D). The Contractor shall furnish the Engineer with a statement as to the specific surface area of the cement, expressed in square centimeters per gram, for each shipment.

For concrete pavements, strength requirements shall be demonstrated using flexural (beam) or compressive (cylinder) tests as required in the drawings.

Either Type I or II cement shall be used unless Type II is specified on the plans. Except when Type II is specified on the plans, Type III cement may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60°F. Type III cement shall be used when high early strength concrete pavement is specified on the drawings.

Different types of cement may be used in the same project, but all cement used in any one monolithic placement of concrete pavement shall be of the same type and brand. Only one brand of each type of cement will be permitted in any one project unless otherwise authorized by the Engineer.

Cement may be delivered in bulk where adequate bin storage is provided. All other cement shall be delivered in bags marked plainly with the name of the manufacturer and the type of cement. Similar information shall be provided in the bills of lading accompanying each shipment of packaged or bulk cement. Bags shall contain 94 pounds net. All bags shall be in good condition at time of delivery.

All cement shall be properly protected against dampness. No caked cement will be accepted.

Cement remaining in storage for a prolonged period of time may be retested and rejected if it fails to conform to any of the requirements of these specifications.

(2) Mixing Water

Water for use in concrete and for curing shall be in accordance with City Standard Specification Section 030020 "Portland Cement Concrete".

(3) Coarse Aggregate

Coarse aggregate for use in concrete mixture shall be in accordance with City Standard Specification Section 030020 "Portland Cement Concrete", Grade No. 2.

(4) Fine Aggregate

Fine aggregate for use in concrete mixture shall be in accordance with City Standard Specification Section 030020 "Portland Cement Concrete", Grade No. 1.

(5) Mineral Filler

Mineral filler shall consist of stone dust, clean crushed sand, or other approved inert material.

(6) Mortar (Grout)

Mortar for repair of concrete pavements shall consist of 1 part cement, 2 parts finely graded sand, and enough water to make the mixture plastic. When required to prevent color difference, white cement shall be added to produce the color required. When required by the Engineer, latex adhesive shall be added to the mortar.

(7) Admixtures

Calcium chloride will not be permitted. Unless otherwise noted, air-entraining, retarding and water-reducing admixtures may be used in all concrete and shall conform to the requirements of City Standard Specification Section 030020 "Portland Cement Concrete".

(8) Reinforcing Steel

Unless otherwise designated on the plans, all steel reinforcement shall be deformed bars, and shall conform to ASTM Designation: A615, Grade 60, and shall be open hearth, basic oxygen or electric furnace new billet steel in accordance with City Standard Specification Section 032020 "Reinforcing Steel".

Dowels shall be plain billet steel smooth bars conforming to ASTM Designation: A615, Grade 60, and shall have hot-dip galvanized finish.

3. STORAGE OF MATERIALS

All cement and aggregate shall be stored and handled in accordance with City Standard Specification Section 030020 "Portland Cement Concrete".

4. MEASUREMENT OF MATERIALS

Measurement of the materials, except water, used in batches of concrete, shall be in accordance with City Standard Specification Section 030020 "Portland Cement Concrete".

5. CLASSIFICATION AND MIX DESIGN

It shall be the responsibility of the Contractor to furnish the mix design to comply with the requirements herein and in accordance with THD Bulletin C-11. The Contractor shall perform, at his own expense, the work required to substantiate the design, except the testing of strength specimens, which will be done by the Engineer. Complete concrete design data shall be submitted to the Engineer for approval.

It shall also be the responsibility of the Contractor to determine and measure the batch quantity of each ingredient, including all water, so that the mix conforms to these specifications and any other requirements shown on the plans.

In lieu of the above mix design responsibility, the Contractor may accept a design furnished by the Engineer; however, this will not relieve the Contractor of providing concrete meeting the requirements of these specifications.

Trial batches will be made and tested using all of the proposed ingredients prior to placing the concrete, and when the aggregate and/or brand of cement or admixture is changed. Trial batches shall be made in the mixer to be used on the job. When transit mix concrete is to be used, the trial designs will be made in a transit mixer representative of the mixers to be used. Batch size shall not be less than 50 percent of the rated mixing capacity of the truck.

Mix designs from previous or concurrent jobs may be used without trial batches if it is shown that no substantial change in any of the proposed ingredients has been made.

This specification section incorporates the requirements of City Standard Specification Section 030020 "Portland Cement Concrete".

6. CONSISTENCY

In cases where the consistency requirements cannot be satisfied without exceeding the maximum allowable amount of water, the Contractor may use, or the Engineer may require, an approved water-reducing or retarding agent, or the Contractor shall furnish additional aggregates or aggregates with different characteristics, which will produce the required results. Additional cement may be required or permitted as a temporary measure until aggregates are changed and designs checked with the different aggregates or admixture.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by fog spray only, and shall be held to a minimum. The concrete shall be

workable, cohesive, possess satisfactory finishing qualities, and of the stiffest consistency that can be placed and vibrated into a homogenous mass. Excessive bleeding shall be avoided. Slump requirements shall be as specified in Table 1.

TABLE 1
Slump Requirements

<u>Construction Method</u>	<u>Desired Slump</u>	<u>Minimum Slump</u>	<u>Maximum Slump</u>
Concrete Pavement (slipformed)	1.5 inches	1 inch	3 inches
Concrete Pavement (formed)	4 inches	2.5 inches	6.5 inches

NOTE: No concrete will be permitted with slump in excess of the maximum shown.

7. QUALITY OF CONCRETE

The concrete shall be uniform and workable. The cement content, maximum allowable water-cement ratio, desired slump, minimum slump, maximum slump, and the strength requirements of the class of concrete for concrete pavement shall conform to the requirements of Table 1 and Table 2 and as required herein.

During the process of the work, the Engineer will cast test beams or cylinders as a check on the flexural or compressive strength of the concrete actually placed. Testing shall be in accordance with City Standard Specification Section 030020 "Portland Cement Concrete". If the required flexural or compressive strength is not secured with the cement specified in Table 2, changes in the batch design will be made. The concrete shall meet either the minimum flexural (beam) strength (7-day or 28-day) or minimum compressive strength (7-day or 28-day) shown in Table 2.

TABLE 2
Class of Concrete for Concrete Pavement

<u>Class of Concrete</u>	<u>Minimum Flexural (Beam) Strength</u>	<u>Minimum Compressive Strength</u>	<u>Maximum Water-Cement Ratio</u>	<u>Coarse Aggregate</u>
P*	450 psi (7 days) 570 psi (28 days)	3200 psi (7 days) 4000 psi (28 days)	5.6 gal./sack 0.50	No. 2 (1½")

* 5% entrained air

8. MIXING CONDITIONS

The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the limits outlined in City Standard Specification Section 038000 "Concrete Structures", Article "Placing Concrete-General", shall not be used. Re-tamping of concrete will not be permitted.

Mixing conditions shall conform to the requirements of City Standard Specification Section 030020 "Portland Cement Concrete".

9. MIXING AND MIXING EQUIPMENT

Mixing and mixing equipment shall conform to the requirements of City Standard Specification Section 030020 "Portland Cement Concrete".

10. READY-MIX PLANTS

The requirements for ready-mix plants shall be as specified in City Standard Specification Section 030020 "Portland Cement Concrete".

11. PLACING, CURING AND FINISHING

All subsurface utilities must be inspected, tested, and accepted prior to any paving.

Subgrade preparation shall be as specified on the plans. The placing of concrete, including construction of forms and falsework, curing and finishing shall be in accordance with City Standard Specification Section 038000 "Concrete Structures". For membrane curing, curing material shall conform to Type 2, Class A curing compound, or as otherwise shown on the drawings.

12. JOINTS IN CONCRETE PAVEMENT

The placing of joints in concrete pavement shall be in accordance with City Standard Specification Section 038000 "Concrete Structures" and as detailed on the drawings.

13. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, the quantities of concrete for concrete pavement(s), which will constitute the completed and accepted pavement(s) in-place, will be measured by the square yard or square foot for the indicated thickness and type of cement.

Payment shall be full compensation for furnishing, hauling, mixing, placing, curing and finishing all concrete; all grouting and pointing; furnishing and placing reinforcing steel and steel dowels as shown on the plans; furnishing and placing drains; furnishing and placing metal flashing strips; furnishing and placing expansion joint material, joint filler and sealants, and contraction (control) joints required by this specification or shown on the plans; and for all forms and falsework, labor, tools, equipment and incidentals necessary to complete the work.

Any paving placed prior to inspection, testing, and acceptance of underground utilities may be rejected by the City and will be replaced at the Contractor's expense after correcting any subsurface utility defects.

SECTION 025802
TEMPORARY TRAFFIC CONTROLS DURING CONSTRUCTION

1. DESCRIPTION

This specification shall govern all work required for Temporary Traffic Controls during construction. The work shall include furnishing, installing, moving, replacing, and maintaining all temporary traffic controls including, but not limited to, barricades, signs, barriers, cones, lights, signals, temporary detours, temporary striping and markers, flagger, temporary drainage pipes and structures, blue business signs, and such temporary devices as necessary to safely complete the project.

2. MATERIALS

Traffic control devices shall conform to the latest edition of the "Texas Manual on Uniform Traffic Control Devices", unless indicated otherwise on the Traffic Control Plan.

3. METHODS

Sufficient traffic control measures shall be used to assure a safe condition and to provide a minimum of inconvenience to motorists and pedestrians.

If the Traffic Control Plan (TCP) is included in the drawings, any changes to the TCP by the Contractor shall be prepared by a Texas licensed professional engineer and submitted to the City Traffic Engineer for approval, prior to construction. If the TCP is not included in the drawings, the Contractor shall provide the TCP prepared by a Texas licensed professional engineer and submit the TCP to the City Traffic Engineer for approval, prior to construction.

The Contractor is responsible for implementing and maintaining the traffic control plan and will be responsible for furnishing all traffic control devices, temporary signage and ATSSA certified flaggers. The construction methods shall be conducted to provide the least possible interference to traffic so as to permit the continuous movement of traffic in all allowable directions at all times. The Contractor shall cleanup and remove from the work area all loose material resulting from construction operations at the end of each workday.

All signs, barricades, and pavement markings shall conform to the BC standard sheets, TCP sheets and the latest version of the "Texas Manual on Uniform Traffic Control Devices".

The Contractor may be required to furnish additional barricades, signs, and warning lights to maintain traffic and promote motorists safety. Any such additional signs and barricades will be considered subsidiary to the pay item for traffic control. All signs, barricades, and posts will be either new or freshly painted.

The contractor and any traffic control subcontractor must be ATSSA certified for Traffic Control.

A competent person, responsible for implementation of the TCP and for traffic safety, shall be designated by the Contractor.

The name and off-hours phone number of the competent person shall be provided in writing at the Pre-Construction Conference.

The competent person shall be on site, during working hours and on call at all times in the event of off-hour emergency.

The contractor must provide temporary blue sign boards that direct traffic to businesses and driveways during each phase of construction – see example below. The sign boards may be either skid mounted or barrel mounted. The City will assist the contractor in determining which businesses and driveways will receive signage during various construction phases. The provision, installation, and removal of signage will be considered to be subsidiary to the contract items provided for “Traffic Control.”

Example Blue Sign



4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, temporary traffic controls during construction shall be measured as a lump sum. Payment shall include, but not be limited to, furnishing, installing, moving, replacing and maintaining all temporary traffic controls including, but not limited to, barricades, signs, barriers, cones, lights, signals, temporary striping and markers, flaggers, removable and non-removable work zone pavements markings and signage, channelizing devices, temporary detours, temporary flexible-reflective roadway marker tabs, temporary traffic markers, temporary drainage pipes and structures, blue business signs, and such temporary devices and relocation of existing signs and devices. Payment shall be full compensation for all labor, equipment, materials, personnel, and incidentals necessary to provide a safe condition during

construction of all phases and elements of the project and to complete the work.

Payment will be made on the following basis: The initial monthly estimate will include 50% of the lump sum bid amount minus retention (typically 5%). The balance will be paid with the final estimate, upon completion of the project.

SECTION 025807
PAVEMENT MARKINGS
(PAINT AND THERMOPLASTIC)

1. DESCRIPTION

This item shall consist of markings and stripes on the surface of the roadways or parking facilities applied in accordance with this specification and at the locations shown on the drawings or as directed by the Engineer.

2. MATERIALS

Type I Pavement Marking Materials shall be in accordance with TxDOT Departmental Material Specification DMS-8220 "Hot Applied Thermoplastic". All roadway markings shall be thermoplastic.

Type II Pavement Marking Materials shall be in accordance with TxDOT Departmental Material Specification DMS-8200 "Traffic Paint" and are not to be used for roadway markings except as primer/sealer for Type 1 markings. Type II Pavement Markings shall be allowed for parking facilities if called for in the plans.

Glass Traffic Beads shall be drop-on glass beads conforming to TxDOT Departmental Material Specification DMS-8290 "Glass Traffic Beads".

3. CONSTRUCTION METHODS

- 3.1 Weather Limitations - Pavement marking shall be performed only when the existing surface is dry and clean, when the atmospheric temperature is above 40°F., and when the weather is not excessively windy, dusty, or foggy. The suitability of the weather will be determined by the Engineer.
- 3.2 Equipment - All equipment for the work shall be approved by the Engineer and shall include the apparatus necessary to properly clean the existing surface, and mechanical marking machine, and such auxiliary hand painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an approved atomizing spray-type marking machine suitable for application of pavement markings. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross-sections and clear-out edges without running or spattering and within the limits for straightness set forth herein.

Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for marking the width required.

- 3.3 Preparation of Existing Surface - Immediately before application of the paint or thermoplastic, the existing surface shall be dry and entirely free from old pavement markings and markers, dirt, grease, oil, acids, laitance, or other foreign matter which could reduce the bond between the marking and the pavement. The surface shall be thoroughly cleaned by sweeping and blowing as required to remove all dirt, laitance and loose materials. Areas that cannot be satisfactorily cleaned by brooming and blowing shall be scrubbed as directed with a water solution of trisodium phosphate (10% Na_3PO_4 by weight) or an approved equal solution. After scrubbing, the solution shall be rinsed off and the surface dried prior to marking.

- 3.4 Layouts and Alignments - Suitable layouts and lines of proposed stripes shall be spotted in advance of the marking application. Control points shall be spaced at such intervals as will insure accurate location of all markings.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the markings.

At least 72 hours prior to applying the permanent pavement markings, the Contractor shall notify the Engineer and City Construction Inspector to obtain City approval for the location, alignment and layout of the pavement markings.

- 3.5 Application - Markings shall be applied at the locations and to the dimensions and spacing indicated on the plans or as specified. Markings shall not be applied until the layouts, indicated alignment, and the condition of the existing surface have been approved by the Engineer.

In the application of straight stripes, any deviation of the edges exceeding 1/2 inch in 50 feet shall be obliterated and the marking corrected. The width of the markings shall be as designated within a tolerance of 5%. All markings shall be performed to the satisfaction of the Engineer.

Paint shall be applied uniformly by suitable equipment at a rate of not less than 105 or more than 115 square feet per gallon.

The Contractor shall furnish a certified report on the quality of materials ordered for the work. This report shall not be interpreted as a basis for final acceptance. The Engineer shall be notified upon arrival of shipment for inspecting and sampling of the materials. When required, all emptied containers shall be returned to the paint material storage or made available for tallying by the Engineer. The containers shall

not be removed from the job site or destroyed without permission. The Contractor shall make an accurate accounting of the paint materials used in the accepted work.

- 3.6 Protection - After application, all markings shall be protected while drying. The fresh markings shall be protected from damage of any kind. The Contractor shall be directly responsible for protecting the markings and shall erect or place suitable warning signs, flags or barricades, protective screens or coverings as required. All surfaces shall be protected from disfiguration by spatter, splashes, spillage, drippings of paint or other materials.

- 3.7 Defective Workmanship or Material - When any material not conforming to the requirements of the specifications or drawings has been delivered to the project or incorporated in the work, or any work performed is of inferior quality, such material or work shall be corrected as directed by the Engineer, at the expense of the Contractor.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, pavement markings shall be measured by the square foot or linear foot of each type of marking. Eliminating existing pavement markings and markers will not be measured and paid for separately, but shall be subsidiary to the pavement marking items.

Payment shall be full compensation for furnishing all materials and for eliminating existing pavement markings and markers, for all preparation, layout and application of the materials, and for all labor, equipment, tools and incidentals necessary to complete the work.

SECTION 025813
PREFORMED THERMOPLASTIC STRIPING, WORDS AND EMBLEMS

1. DESCRIPTION

This specification shall govern all work for furnishing and installing preformed thermoplastic striping, words and emblems required to complete the project.

2. PRE-CONSTRUCTION CONFERENCE

When required by the Engineer, prior to beginning work on the markings but after receipt by the Engineer of the required information, a conference will be held between the representatives of the Contractor and the Engineer to set up more completely the sequence of work to be followed and the estimated progress schedule.

3. MATERIALS

The preformed pavement marking material shall be thermoplastic material meeting the specifications of TxDOT Departmental Material Specification DMS-8220 "Hot Applied Thermoplastic," and shall be approved by the Engineer for use on this project.

4. CONSTRUCTION

- (1) General. The Contractor shall furnish all materials and equipment and perform work or services necessary for complete and proper construction of the completed system of pavement markings.
- (2) Traffic Conditions. Roadways on which markings are to be placed may be either free of traffic or open to traffic. On roadways already open to traffic, markings shall be placed under existing traffic conditions.
- (3) Dimensions. Markings will be in accordance with the color, length, width, shape, configuration and location requirements of the plans and as directed by the Engineer.
- (4) Methods. All material placement shall be in accordance with TxDOT Standard Specification Item 668 "Prefabricated Pavement Markings" and City Section 025807 "Pavement Markings (Paint and Thermoplastic)."
- (5) Surface Preparation. The pavement upon which the markings are to be placed shall be cleaned and prepared, to the satisfaction of the Engineer, prior to placement of the markings. Cleaning shall be by any effective method, approved by the Engineer that completely and effectively removes contaminants, loose materials, and conditions deleterious to proper adhesion. Surfaces shall be further prepared after cleaning by sealing or priming, as recommended by the manufacturer of the pavement marking material.

- (6) Moisture. Pavement to which the material is to be applied shall be completely dry. When questionable, pavements will be considered dry if, on a sunny day after observation for 15 minutes, no condensation occurs on the underside of a one (1) square foot piece of clear plastic that has been placed on the pavement and weighted down on the edges.
- (7) Temperature. Pavement and ambient air temperature requirements recommended by the material manufacturer shall be observed. If no temperature requirements are established by the materials manufacturer, material will not be placed if the pavement temperature is below 60 degrees F or if it is above 120 degrees F.
- (8) Clean-Up. At all times, the project site shall be kept free of all unnecessary traffic hazards. Upon completion of the work, the Contractor shall remove all rubbish from the work site, and shall clean and restore the area to a manner acceptable to the Engineer. Also, all damage done by the Contractor during the prosecution of the work must be repaired. Before acceptance, the work site must be neat and in a presentable condition throughout. No extra compensation will be allowed for fulfilling these clean-up requirements.

5. PERFORMANCE

- (1) Adhesion. Installed pavement markings shall adhere to the pavement sufficiently to prevent lifting, shifting, smearing, spreading, flowing or tearing by traffic.
- (2) Appearance. In addition to complying with all requirements listed herein, pavement markings shall present a neat, uniform appearance, and shall be free of unsightly conditions. Markings shall be free of ragged edges, misshapen lines or contours, and splices in transverse markings.
- (3) Visibility. The pavement marking material, in place on the roadway, shall have uniform and distinctive retro-reflectance when observed in accordance with TxDOT Test Method Tex-828-B.
- (4) Observation Period. All material, workmanship and labor furnished shall be covered by manufacturer's guarantee and/or warranty for a period of 12 months commencing on the final delivery date of the materials.

Pavement markings that fail to meet all requirements of this specification shall be removed and replaced at the expense of the Contractor within 30 working days following notification by the Engineer of such failure. All replacement pavement markings shall also meet all requirements of this specification for the same warranty period after installation.

6. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, preformed striping, words and emblems shall be measured by each type and color indicated on the Bid Form including preformed arrows and words or other symbols as indicated in the Bid Form.

Payment shall be full compensation for cleaning the pavement by any suitable means other than blast cleaning, for furnishing and placing all materials, and for all labor, tools, equipment and incidentals necessary to complete the work.

SECTION 027402
REINFORCED CONCRETE PIPE CULVERTS

1. DESCRIPTION

This specification shall govern the furnishing and placing of reinforced concrete pipe culverts and the material and incidental construction requirements for reinforced concrete pipe sewers. The culvert pipe shall be installed in accordance with the requirements of these specifications to the lines and grades shown on the plans, and shall be of the classes, sizes and dimensions shown thereon. The installation of pipe shall include all joints or connections to new or existing pipe, headwalls, etc., as may be required to complete the work.

2. MATERIALS

1. General. Except as modified herein, materials, manufacture and design of pipe shall conform to ASTM C-76 for Circular Pipe. All pipe shall be machine made or cast by a process which will provide for uniform placement of the concrete in the form and compaction by mechanical devices which will assure a dense concrete. Concrete shall be mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete will not be acceptable for use in precast concrete pipe.
2. Design. All pipe shall be Class III (Wall "B") unless otherwise specified on the plans. The shell thickness, the amount of circumferential reinforcement and the strength of the pipe shall conform to the specified class as summarized in ASTM C-76 for Circular Pipe.
3. Sizes and Permissible Variations.
 - a. Variations in diameter, size, shape, wall thickness, reinforcement, placement of reinforcement, laying length and the permissible underrun of length shall be in accordance with the applicable ASTM Specification for each type of pipe as referred to previously.
 - b. Where rubber gasket pipe joints are to be used, the design of the Joints and Permissible Variations in Dimensions shall be in accordance with ASTM C-443.
4. Workmanship and Finish. Pipe shall be substantially free from fractures, large or deep cracks and surface roughness. The ends of the pipe shall be normal to the walls and centerline of the pipe within the limits of variations allowed under the applicable ASTM specification.
5. Curing. Pipe shall be cured in accordance with the applicable ASTM Specification for each type of pipe as referred to above.
6. Marking. The following information shall be clearly marked on each section of pipe:

- a. The class of pipe.
 - b. The date of manufacture.
 - c. The name or trademark of the manufacturer.
 - d. Marking shall be indented on the pipe section or painted thereon with waterproof paint.
7. Minimum Age for Shipment. Pipe shall be considered ready for shipment when it conforms to the requirements of the tests specified herein.
8. Inspection. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the Engineer at the pipe manufacturing plant. In addition, the finished pipe shall be subject to further inspection by the Engineer at the project site prior to and during installation.
9. Causes for Rejection. Pipe shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual sections of pipe may be rejected because of any of the following:
- a. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.
 - b. Defects that indicate imperfect proportioning, mixing and molding.
 - c. Surface defects indicating honeycombed or open texture.
 - d. Damaged ends, where such damage would prevent making a satisfactory joint.
10. Repairs. Pipe may be repaired if necessary, because of occasional imperfections in manufacture or accidental injury during the handling, and will be acceptable if, in the opinion of the Engineer, the repairs are sound and properly finished and cured and the repaired pipe conforms to the requirements of the specifications.
11. Rejections. All rejected pipe shall be plainly marked by the Engineer and shall be replaced by the Contractor with pipe that meets the requirements of these specifications. Such rejected pipe shall be removed immediately from the worksite.
12. Jointing Materials. Unless otherwise specified on the plans, the Contractor shall have the option of making the joints by any of the following methods:
- a. Ram-Nek, a pre-formed plastic base joint material manufactured by K. T. Knyder Company, Houston, Texas, or an approved equal. Use of Talcote as joint material will not be not permitted. Ram-Nek joint material and primer shall be supplied for

use on pipe in the following sizes, which is the minimum that will be required. Additional Ram-Nek may be required if, in the opinion of the Engineer, a proper joint is not secured.

<u>Pipe Size</u>	<u>Primer Per 100 Jts.</u>	<u>Cut Lengths Per Joint</u>
12"	1.5 gals.	1½ pcs 1" x 2'-5"
15"	1.9 gals.	2 pcs 1" x 2'-5"
18"	2.7 gals.	1½ pcs 1½" x 3'-5"
21"	3.8 gals.	2 pcs 1½" x 3'-5"
24"	6.2 gals.	2 pcs 1½" x 3'-5"
30"	8.5 gals.	2½ pcs 1½" x 3'-5"
36"	9.5 gals.	3 pcs 1¾" x 3'-5"
42"	12.0 gals.	3½ pcs 1¾" x 3'-5"
48"	15.0 gals.	4 pcs 1¾" x 3'-5"
54"	20.0 gals.	4½ pcs 1¾" x 3'-5"
60"	25.0 gals.	5 pcs 1¾" x 3'-5"
66"	30.0 gals.	5½ pcs 1¾" x 3'-5"
72"	32.0 gals.	6 pcs 2" x 3'-5"
84"	35.0 gals.	7 pcs 2" x 3'-5"

- b. TYLOX Types "C", "C-P" or "CR" rubber gaskets, as applicable, as manufactured by Hamilton Kent Manufacturing Company, Kent, Ohio, or approved equal. All gaskets, lubricants, adhesives, etc., shall be manufactured, constructed, installed, etc., as recommended by the manufacturer of the rubber gasket material and conform to ASTM Designation: C-443. In addition, the Contractor shall furnish to the City, for approval, manufacturer's brochures detailing the complete use, installation, and specifications of concrete pipe and rubber gaskets before any rubber gasket material is used on the project. All rubber gaskets shall be fabricated from synthetic rubber.
- c. Cement Mortar is prohibited from jointing pipe except at manholes, pipe junctions, etc., or where specifically approved by the Engineer.
- d. Geotextile for wrapping pipe joints shall be Class "A" subsurface drainage type in accordance with AASHTO M288.

3. CONSTRUCTION METHODS

Reinforced concrete pipe culverts shall be constructed from the specified materials in accordance with the following methods and procedures:

1. Excavation. All excavation shall be in accordance with the requirements of City Standard Specification Section 022020 "Excavation and Backfill for Utilities," except where tunneling or jacking methods are shown on the plans or permitted by the Engineer. When pipe is laid in a trench, the trench, when completed and shaped to receive the pipe, shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of the backfill and bedding material under and around the pipe. The Contractor shall make such temporary provisions as may be necessary to insure adequate drainage of the trench and bedding during the construction operation. Pipe shall be placed such that the identification markings are visible at the top prior to backfill.
2. Bedding. The pipe shall be bedded in accordance with the bedding details shown on the drawings. Bedding shall not be measured for pay, but shall be subsidiary to other work.

If the subgrade of the trench is unstable, even if this condition occurs at relatively shallow depths, full encasement of the pipe with crushed stone shall be required.

3. Laying Pipe. Unless otherwise authorized by the Engineer, the laying of pipe on the prepared foundation shall be started at the outlet (downstream) end with the spigot or tongue end pointing downstream, and shall proceed toward the inlet (upstream) end with the abutting sections properly matched, true to the established lines and grades. Where bell and spigot pipe are used, cross trenches shall be cut in the foundation to allow the barrel of the pipe to rest firmly upon the prepared bed. These cross trenches shall be not more than two inches larger than the bell ends of the pipe. Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without disturbing the prepared foundation and the sides of the trench. The ends of the pipe shall be carefully cleaned before the pipe is placed. As each length of pipe is laid, the mouth of the pipe shall be protected to prevent the entrance of earth or bedding material. The pipe shall be fitted and matched so that when laid in the bed, it shall form a smooth, uniform conduit. When elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, the pipe shall be laid in the trench in such position that the markings "TOP" or "BOTTOM" shall not be more than 5 degrees from the vertical plane through the longitudinal axis of the pipe.

For pipe over 42 inches in diameter, the Contractor may drill two holes not larger than 2 inches in diameter, in the top of each section of the pipe, to aid in lifting and placing.

The holes shall be neatly drilled, without spalling of the concrete, and shall be done without the cutting of any reinforcement. After the pipe is laid, the holes shall be filled with mortar and properly cured, and placed such that they are visible from the top for inspection prior to backfill.

Multiple installations of reinforced concrete pipe shall be laid with the center lines of

individual barrels parallel. When not otherwise indicated on plans, the following clear distances between outer surfaces of adjacent pipe shall be used.

Diameter of Pipe	18"	24"	30"	36"	42"	48"	54"	60" to 84"
Clear Distance Between Pipes	0'-9"	0'-11"	1'-1"	1'-3"	1'-5"	1'-7"	1'-11"	2'-0"

4. Jointing.

- a. If the use of Portland cement mortar joints is allowed, all pipe shall be jointed tight and sealed with stiff mortar, composed of one part Portland cement and two parts sand, so placed as to form a durable water-tight joint. The installation shall be as required by the Engineer.
- b. Joints using Rubber Gaskets: Where rubber gasket pipe joints are required by the plans, the joint assembly shall be made according to the recommendations of the gasket manufacturer. Water-tight joints will be required when using rubber gaskets.
- c. Joints using Cold-Applied Preformed Plastic Gaskets shall be made as follows:

A suitable prime of the type recommended by the manufacturer of the gasket joint sealer shall be brush-applied to the tongue and groove joint surfaces and the end surfaces and allowed to dry and harden. No primer shall be applied over mud, sand or dirt or sharp cement protrusions. The surface to be primed must be clean and dry when primer is applied.

Before laying the pipe in the trench, the plastic gasket sealer shall be attached around the tapered tongue or tapered groove near the shoulder or hub of each pipe joint. The paper wrapper shall be removed from one side only of the two-piece wrapper on the gasket and pressed firmly to the clean, dry pipe joint surface. The outside wrapper shall not be removed until immediately before pushing the pipe into its final position.

When the tongue is correctly aligned with the flare of the groove, the outside wrapper on the gasket shall be removed and the pipe shall be pulled or pushed home with sufficient force and power (backhoe shovel, chain hoist, ratchet hoist or winch) to cause the evidence of squeeze-out of the gasket material on the inside or outside around the complete pipe joint circumference. The extruded gasket material shall be smoothed out over the joint on the exterior and interior of the pipe. Any joint material pushed out into the interior of the pipe that would tend to obstruct the flow shall be removed. (Pipe shall be pulled home in a straight line with all parts of the pipe on line and grade at all times.) Backfilling of pipe laid with plastic gasket joints may proceed as soon as the joint has been inspected and approved by the Engineer. Special precautions shall be taken in placing and compacting backfill to

avoid damage to the joints.

When the atmospheric temperature is below 60 degrees F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 degrees F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Gaskets shall then be applied to pipe joints immediately prior to placing pipe in the trench, followed by connection to previously laid pipe.

- d. Pipe Joints for storm sewers shall be wrapped with geotextile material. The geotextile wrap shall be at least 2 feet wide and shall be centered on each joint.
5. After the pipe has been placed, bedded and jointed as specified, filling and/or backfilling shall be done in accordance with the applicable requirements of City Standard Specification Section 022020 "Excavation and Backfill for Utilities." If unstable conditions are encountered, fully encase the pipe with crushed stone as described above. When mortar joints are allowed, no fill or backfill shall be placed until the jointing material has been cured for at least six (6) hours.

Special precautions shall be taken in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. For side drain culverts and all other culverts where joints consist of materials other than mortar, immediate backfilling will be permitted.

6. Unless otherwise shown on the plans or permitted in writing by the Engineer, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 4 feet of permanent or temporary compacted fill has been placed thereon. Pipe damaged by the Contractor's equipment shall be removed and replaced by the Contractor at no additional cost.

7. Cleaning and Television Inspection. All enclosed reinforced concrete pipe and manholes installed on this project shall be cleaned and televised in accordance with City Standard Specification Section 027611 "Cleaning and Televised Inspection of Conduits."

4. MEASUREMENT

Unless otherwise specified on the Bid Form, reinforced concrete pipe will be measured by the linear foot. Such measurement will be made between the ends of the pipe barrel along its central axis. Where spurs or branches, or connections to existing pipe lines are involved, measurement of the spur or new connecting pipe will be made from the intersection of its center axis with the outside surfaces of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, that length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be so included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels measured as prescribed above.

5. PAYMENT

Payment for reinforced concrete pipe measured as prescribed above will be made at the contract unit price bid per linear foot for the various sizes of "Reinforced Concrete Pipe" of the class specified.

Payment shall be full compensation for furnishing and transporting the pipe; hauling and placing of earth cushion material where required for bedding pipe; for the preparation and shaping of beds; for hauling, placing and jointing of pipes; for furnishing and installing geotextile pipe joint wrapping; for end finish; for all connections to existing and new structures; for cleaning and television inspection; and for all other items of materials, labor, equipment, tools, excavation, backfill and incidentals necessary to complete the culvert or storm sewer in accordance with the plans and these specifications.

SECTION 030020
PORTLAND CEMENT CONCRETE

1. DESCRIPTION

This specification shall govern for the materials used; for the storing and handling of materials; and for the proportioning and mixing of concrete for culverts, manholes, inlets, curb and gutter, sidewalks, driveways, curb ramps, headwalls and wingwalls, riprap, and incidental concrete construction.

The concrete shall be composed of Portland cement, aggregates (fine and coarse), admixtures if desired or required, and water, proportioned and mixed as hereinafter provided.

2. MATERIALS

(1) Cement

The cement shall be either Type I, II or III Portland cement conforming to ASTM Designation: C150, modified as follows:

Unless otherwise specified by the Engineer, the specific surface area of Type I and II cements shall not exceed 2000 square centimeters per gram (Wagner Turbidimeter – TxDOT Test Method Tex-310-D). For concrete piling, the above limit on specific surface area is waived for Type II cement only. The Contractor shall furnish the Engineer, with each shipment, a statement as to the specific surface area of the cement expressed in square centimeters per gram.

For cement strength requirements, either the flexural or compressive test may be used.

Either Type I or II cement shall be used unless Type II is specified on the plans. Except when Type II is specified on the plans, Type III cement may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60°F. Type III cement may be used in all precast prestressed concrete, except in piling when Type II cement is required for substructure concrete.

Different types of cement may be used in the same structure, but all cement used in any one monolithic placement shall be of the same type and brand. Only one brand of each type will be permitted in any one structure unless otherwise authorized by the Engineer.

Cement may be delivered in bulk where adequate bin storage is provided. All other cement shall be delivered in bags marked plainly with the name of the manufacturer and the type of cement. Similar information shall be provided in the bills of lading accompanying each shipment of packaged or bulk cement. Bags shall contain 94 pounds net. All bags shall be in good condition at time of delivery.

All cement shall be properly protected against dampness. No caked cement will be accepted.

Cement remaining in storage for a prolonged period of time may be retested and rejected if it fails to conform to any of the requirements of these specifications.

(2) Mixing Water

Water for use in concrete and for curing shall be free from oils, acids, organic matter or other deleterious substances and shall not contain more than 1000 parts per million of chlorides as CL nor more than 1000 parts per million of sulfates as SO₄.

Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be sampled and tested before use in structural concrete.

Tests shall be made in accordance with the "Method of Test for Quality of Water to be Used in Concrete" (AASHTO Method T26), except where such methods are in conflict with provisions of this specification.

(3) Coarse Aggregate

Coarse aggregate shall consist of durable particles of gravel, crushed blast furnace slag, crushed stone, or combinations thereof; free from frozen material or injurious amount of salt, alkali, vegetable matter, or other objectionable material either free or as an adherent coating; and its quality shall be reasonably uniform throughout. It shall not contain more than 0.25 percent by weight of clay lumps, nor more than 1.0 percent by weight of shale, nor more than 5 percent by weight of laminated and/or friable particles when tested in accordance with TxDOT Test Method Tex-413-A. It shall have a wear of not more than 40 percent when tested in accordance with TxDOT Test Method Tex-410-A.

Unless otherwise specified on the plans, coarse aggregate will be subjected to five cycles of the soundness test in accordance with TxDOT Test Method Tex-411-A. The loss shall not be greater than 12 percent when sodium sulfate is used, or 18 percent when magnesium sulfate is used.

Permissible sizes of aggregate shall be governed by Table 4 and Table 1, except that when exposed aggregate surfaces are required, coarse aggregate gradation will be as specified on the plans.

When tested by approved methods, the coarse aggregate, including combinations of aggregates when used, shall conform to the grading requirements shown in Table 1.

TABLE 1
Coarse Aggregate Gradation Chart

Percent Retained on Each Sieve										
<u>Aggregate Grade No.</u>	<u>Nominal Size</u>	<u>2-½ In.</u>	<u>2 In.</u>	<u>1-½ In.</u>	<u>1 In.</u>	<u>¾ In.</u>	<u>½ In.</u>	<u>¾ In.</u>	<u>No. 4</u>	<u>No. 8</u>
1	2 in.	0	0 to 20	15 to 50		60 to 80			95 to 100	
2 (467)*	1-½ in.		0	0 to 5		30 to 65		70 to 90	95 to 100	
4 (57)*	1 in.			0	0 to 5		40 to 75		90 to 100	95 to 100
8	¾ in.						0	0 to 5	35 to 80	90 to 100

*Numbers in parenthesis indicate conformance with ASTM C33.

The aggregate shall be washed. The Loss by Decantation (TxDOT Test Method Tex-406-A) plus the allowable weight of clay lumps, shall not exceed one percent, or the value shown on the plans, whichever is smaller.

(4) Fine Aggregate

Fine aggregate shall consist of clean, hard, durable and uncoated particles of natural or manufactured sand or a combination thereof, with or without a mineral filler. It shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material and it shall not contain more than 0.5 percent by weight of clay lumps. When subjected to the color test for organic impurities (TxDOT Test Method Tex-408-A), it shall not show a color darker than standard.

The fine aggregate shall produce a mortar having a tensile strength equal to or greater than that of Ottawa sand mortar when tested in accordance with TxDOT Test Method Tex-317-D.

Where manufactured sand is used in lieu of natural sand for slab concrete subject to direct traffic, the acid insoluble residue of the fine aggregate shall be not less than 28 percent by weight when tested in accordance with TxDOT Test Method Tex-612-J.

When tested by approved methods, the fine aggregate or combination of aggregates, including mineral filler, shall conform to the grading requirements shown in Table 2.

TABLE 2
Fine Aggregate Gradation Chart

<u>Aggregate Grade No.</u>	<u>Percent Retained on Each Sieve</u>							
	<u>3/8 In.</u>	<u>No. 4</u>	<u>No. 8</u>	<u>No. 16</u>	<u>No. 30</u>	<u>No. 50</u>	<u>No. 100</u>	<u>No. 200</u>
1	0	0 to 5	0 to 20	15 to 50	35 to 75	70 to 90	90 to 100	97 to 100

NOTE 1: Where manufactured sand is used in lieu of natural sand, the percent retained on the No. 200 sieve shall be 94 to 100.

NOTE 2: Where the sand equivalent value is greater than 85, the retainage on the No. 50 sieve may be 70 to 94 percent.

Fine aggregate will be subjected to the Sand Equivalent Test (TxDOT Test Method Tex-203-F). The sand equivalent shall not be less than 80 nor less than the value shown on the plans, whichever is greater.

For concrete Classes 'A' and 'C', the fineness modulus as defined below for fine aggregates shall be between 2.30 and 3.10.

The fineness modulus will be determined by adding the percentages by weight retained on the following sieves, and dividing by 100; Nos. 4, 8, 16, 30, 50 and 100.

(5) Mineral Filler

Mineral filler shall consist of stone dust, clean crushed sand, or other approved inert material.

(6) Mortar (Grout)

Mortar for repair of concrete shall consist of 1 part cement, 2 parts finely graded sand, and enough water to make the mixture plastic. When required to prevent color difference, white cement shall be added to produce the color required. When required by the Engineer, latex adhesive shall be added to the mortar.

(7) Admixtures

Calcium Chloride will not be permitted. Unless otherwise noted, air-entraining, retarding and water-reducing admixtures may be used in all concrete and shall conform to the following requirements:

A "water-reducing, retarding admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and will retard the initial set of the concrete.

A "water-reducing admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a

given consistency.

- (a) Retarding and Water-Reducing Admixtures. The admixture shall meet the requirements for Type A and Type D admixture as specified in ASTM Designation: C494, modified as follows:
 - (1) The water-reducing retarder shall retard the initial set of the concrete a minimum of 2 hours and a maximum of 4 hours, at a specified dosage rate, at a temperature of 90°F.
 - (2) The cement used in any series of tests shall be either the cement proposed for specific work or a "reference" Type I cement from one mill.
 - (3) Unless otherwise noted on the plans, the minimum relative durability factor shall be 80.

The air-entraining admixture used in the referenced and test concrete shall be neutralized Vinsol resin.

- (b) Air-Entraining Admixture. The admixture shall meet the requirements of ASTM Designation: C260, modified as follows:
 - (1) The cement used in any series of tests shall be either the cement proposed for specific work or a "reference" Type I cement from one mill.
 - (2) Unless otherwise noted on the plans, the minimum relative durability factor shall be 80.

The air-entraining admixture used in the referenced concrete shall be neutralized Vinsol resin.

3. STORAGE OF CEMENT

All cement shall be stored in well-ventilated weatherproof buildings or approved bins, which will protect it from dampness or absorption of moisture. Storage facilities shall be ample, and each shipment of packaged cement shall be kept separated to provide easy access for identification and inspection.

The Engineer may permit small quantities of sacked cement to be stored in the open for a maximum of 48 hours on a raised platform and under waterproof covering.

4. STORAGE OF AGGREGATE

The method of handling and storing concrete aggregate shall prevent contamination with foreign materials. If the aggregates are stored on the ground, the sites for the stockpiles shall be clear of all vegetation and level. The bottom layer of aggregate shall not be disturbed or used without recleaning.

When conditions require the use of two or more sizes of aggregates, they shall be separated to prevent intermixing. Where space is limited, stockpiles shall be separated by physical barriers.

Methods of handling aggregates during stockpiling and subsequent use shall be such that segregation will be minimized.

Unless otherwise authorized by the Engineer, all aggregate shall be stockpiled at least 24 hours to reduce the free moisture content.

5. MEASUREMENT OF MATERIALS

The measurement of the materials, except water, used in batches of concrete, shall be by weight. The fine aggregate, coarse aggregate and mineral filler shall be weighed separately. Where bulk cement is used, it shall be weighed separately, but batch weighing of sacked cement will not be required. Where sacked cement is used, the quantities of material per batch shall be based upon using full bags of cement. Batches involving the use of fractional bags will not be permitted.

Allowance shall be made for the water content in the aggregates.

Bags of cement varying more than 3 percent from the specified weight of 94 pounds may be rejected, and when the average weight per bag in any shipment, as determined by weighing 50 bags taken at random, is less than the net weight specified, the entire shipment may be rejected. If the shipment is accepted, the Engineer will adjust the concrete mix to a net weight per bag fixed by an average of all individual weights which are less than the average weight determined from the total number weighed.

6. CLASSIFICATION AND MIX DESIGN

It shall be the responsibility of the Contractor to furnish the mix design, using a coarse aggregate factor acceptable to the Engineer, for the class(es) of concrete specified. The mix shall be designed by a qualified concrete technician to conform with the requirements contained herein and in accordance with the THD Bulletin C-11. The Contractor shall perform, at his own expense, the work required to substantiate the design, except the testing of strength specimens, which will be done by the Engineer. Complete concrete design data shall be submitted to the Engineer for approval.

It shall also be the responsibility of the Contractor to determine and measure the batch quantity of each ingredient, including all water, so that the mix conforms to these specifications and any other requirements shown on the plans.

Trial batches will be made and tested using all of the proposed ingredients prior to placing the concrete, and when the aggregate and/or brand of cement or admixture is changed. Trial batches shall be made in the mixer to be used on the job. When transit mix concrete is to be used, the trial designs will be made in a transit mixer representative of the mixers to be used. Batch size shall not be less than 50 percent of the rated mixing capacity of the truck.

Mix designs from previous or concurrent jobs may be used without trial batches if it is shown that

no substantial change in any of the proposed ingredients has been made.

The coarse aggregate factor shall not be more than 0.82, except that when the voids in the coarse aggregate exceed 48 percent of the total dry loose volume, the coarse aggregate factor shall not exceed 0.85. The coarse aggregate factor shall not be less than 0.70 for Grades 1, 2 and 3 aggregates.

If the strength required for the class of concrete being produced is not secured with the cement specified in Table 4, the Contractor may use an approved water-reducing or retarding admixture, or he shall furnish aggregates with different characteristics which will produce the required results. Additional cement may be required or permitted as a temporary measure until the redesign is checked.

Water-reducing or retarding agents may be used with all classes of concrete at the option of the Contractor.

When water-reducing or retarding agents are used at the option of the Contractor, reduced dosage of the admixture will be permitted.

Entrained air will be required in accordance with Table 4. The concrete shall be designed to entrain 5 percent air when Grade 2 coarse aggregate is used and 6 percent when Grade 3 coarse aggregate is used. Concrete as placed in the structure shall contain the proper amount as required above with a tolerance of plus or minus 1.5 percentage points. Occasional variations beyond this tolerance will not be cause for rejection. When the quantity of entrained air is found to be above 7 percent with Grade 2 coarse aggregate or above 8 percent for Grade 3 coarse aggregate, additional test beams or cylinders will be made. If these beams or cylinders pass the minimum flexural or compressive requirements, the concrete will not be rejected because of the variation in air content.

7. CONSISTENCY

In cases where the consistency requirements cannot be satisfied without exceeding the maximum allowable amount of water, the Contractor may use, or the Engineer may require, an approved water-reducing or retarding agent, or the Contractor shall furnish additional aggregates or aggregates with different characteristics, which will produce the required results. Additional cement may be required or permitted as a temporary measure until aggregates are changed and designs checked with the different aggregates or admixture.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by fog spray only, and shall be held to a minimum. The concrete shall be workable, cohesive, possess satisfactory finishing qualities, and of the stiffest consistency that can be placed and vibrated into a homogenous mass. Excessive bleeding shall be avoided. Slump requirements will be as specified in Table 3.

TABLE 3
Slump Requirements

<u>Concrete Designation</u>	<u>Desired Slump</u>	<u>Max. Slump</u>
Structural Concrete:		
(1) Thin-Walled Sections (9" or less)	4 inches	5 inches
(2) Slabs, Caps, Columns, Piers, Wall Sections over 9", etc.	3 inches	4 inches
Underwater or Seal Concrete	5 inches	6 inches
Riprap, Curb, Gutter and Other Miscellaneous Concrete	2.5 inches	4 inches

NOTE: No concrete will be permitted with slump in excess of the maximums shown.

8. QUALITY OF CONCRETE

General

The concrete shall be uniform and workable. The cement content, maximum allowable water-cement ratio, the desired and maximum slump and the strength requirements of the various classes of concrete shall conform to the requirements of Table 3 and Table 4 and as required herein.

During the process of the work, the Engineer or his designated representative will cast test cylinders or beams as a check on the compressive or flexural strength of the concrete actually placed. Test cylinders must be picked up by the testing lab within 24 hours.

A test shall be defined as the average of the breaking strength of two cylinders or two beams, as the case may be. Specimens will be tested in accordance with TxDOT Test Methods Tex-418-A or Tex-420-A.

Test beams or cylinders will be required as specified in the contract documents. For small placements on structures such as manholes, inlets, culverts, wingwalls, etc., the Engineer may vary the number of tests to a minimum of one for each 25 cubic yards placed over a several day period.

All test specimens, beams or cylinders, representing tests for removal of forms and/or falsework shall be cured using the same methods, and under the same conditions as the concrete represented.

"Design Strength" beams and cylinders shall be cured in accordance with THD Bulletin C-11.

The Contractor shall provide and maintain curing facilities as described in THD Bulletin C-11 for the purpose of curing test specimens. Provision shall be made to maintain the water in the curing tank at temperatures between 70°F and 90°F.

When control of concrete quality is by twenty-eight-day compressive tests, job control will be by seven-day compressive tests which are shown to provide the required twenty-eight-day strength, based on results from trial batches. If the required seven-day strength is not secured with the

cement specified in Table 4, changes in the batch design will be made.

TABLE 4
Classes of Concrete

Class of Concrete	Sacks Cement per C.Y. (min.)	Minimum Compressive Strength (f _c) 28-Day(psi)	Min. Beam Strength 7-Day (psi)	Maximum Water-Cement Ratio (gal/sack)	Coarse Aggregate No.
A*	5.0	3000	500***	6.5	2-4-8*****
B*	4.5	2500	417	8.0	2-4-8*****
C*	6.0	3600	600***	6.0	1-2-4**
D	6.0	3000	500	7.0	2-4
S	6.5	4000	570	5.0	2-4

*Entrained Air (slabs, piers and bent concrete).

**Grade 1 Coarse Aggregate may be used in foundation only (except cased drilled shafts).

***When Type II Cement is used with Class C Concrete, the 7-day beam break requirement will be 550 psi; with Class A Concrete, the minimum 7-day beam break requirement will be 460 psi.

****Permission to use Grade 8 Aggregate must have prior approval of the Engineer.

9. MIXING CONDITIONS

The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the limits outlined in City Standard Specification Section 038000 "Concrete Structures", Article "Placing Concrete-General", shall not be used. Retamping of concrete will not be permitted.

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, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall, or from freezing temperatures. If necessary to continue operations during rainfall, the Contractor shall also provide protective coverings for the material stockpiles. Aggregate stockpiles need be covered only to the extent necessary to control the moisture conditions in the aggregates to adequately control the consistency of the concrete.

10. MIXING AND MIXING EQUIPMENT

All equipment, tools, and machinery used for hauling materials and performing any part of the work shall be maintained in such condition to insure completion of the work underway without excessive delays for repairs or replacements.

The mixing shall be done in a batch mixer of approved type and size that will produce uniform

distribution of the material throughout the mass. Mixers may be either the revolving drum type or the revolving blade type, and shall be capable of producing concrete meeting the requirements of these specifications.

After all the ingredients are assembled in the drum, the mixing shall continue not less than 1 minute for mixers of one cubic yard or less capacity plus 15 seconds for each additional cubic yard or portion thereof.

The mixer shall operate at the speed and capacity designated by the Mixer Manufacturers Bureau of the Associated General Contractors of America. The mixer shall have a plate affixed showing the manufacturer's recommended operating data.

The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.

The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch.

The first batch of concrete materials placed in the mixer for each placement shall contain an extra quantity of sand, cement and water sufficient to coat the inside surface of the drum.

Upon the cessation of mixing for any considerable length of time, the mixer shall be thoroughly cleaned.

The concrete mixer shall be equipped with an automatic timing device which is put into operation when the skip is raised to its full height and dumping. This device shall lock the discharging mechanism and prevent emptying of the mixer until all the materials have been mixed together for the minimum time required, and it shall ring a bell after the specified time of mixing has elapsed.

The water tank shall be arranged so that the amount of water can be measured accurately, and when the tank starts to discharge, the inlet supply shall cut off automatically.

Whenever a concrete mixer is not adequate or suitable for the work, it shall be removed from the site upon a written order from the Engineer and a suitable mixer provided by the Contractor.

Pick-up and thro-over blades in the drum of the mixer which are worn down more than 10 percent in depth shall be repaired or replaced with new blades.

Improperly mixed concrete shall not be placed in the structure.

Job mix concrete shall be concrete mixed in an approved batch mixer in accordance with the requirements stated above, adjacent to the structure for which the concrete is being mixed, and moved to the placement site in non-agitating equipment.

11. READY-MIX PLANTS

A. General. It shall be the Contractor's responsibility to furnish concrete meeting all requirement of the governing specification sections, and concrete not meeting the slump, workability and consistency requirements of the governing specification sections shall not

be placed in the structure or pavement.

Ready-Mixed Concrete shall be mixed and delivered by means of one of the following approved methods.

- (1) Mixed completely in a stationary mixer and transported to the point of delivery in a truck agitator or a truck mixer operating at truck agitator or truck mixer agitation speed. (Central-Mix Concrete)
- (2) Mixed complete in a truck mixer and transported to the placement site at mixing and/or agitating speed (Transit-Mix Concrete), subject to the following provisions:
 - (a) Truck mixers will be permitted to transport concrete to the job site at mixing speed if equipped with double actuated counters which will separate revolutions at mixing speed from total revolutions.
 - (b) Truck mixers equipped with a single actuated counter counting total revolutions of the drum shall mix the concrete at the plant not less than 50 nor more than 70 revolutions at mixing speed, transport it to the job site at agitating speed and complete the required mixing before placing the concrete.
- (3) Mixed completely in a stationery mixer and transported to the job site in approved non-agitating trucks with special bodies. This method of transporting will be permitted for concrete pavement only.

B. Equipment.

- (1) Batching Plant. The batching plant shall be provided with adequate bins for batching all aggregates and materials required by the specifications.

Bulk cement shall be weighed on a scale separate from those used for other materials and in a hopper entirely free and independent of that used for weighing the aggregates.

- (2) Mixers and Agitators.

- (a) General: Mixers shall be of an approved stationary or truck-type capable of combining the ingredients into a thoroughly mixed and uniform mass.

Facilities shall be provided to permit ready access to the inside of the drum for inspection, cleaning and repair of blades.

Mixers and agitators shall be subject to daily examination for changes in condition due to accumulation of hardened concrete and/or wear of blades, and any hardened concrete shall be removed before the mixer will be permitted to be used. Worn blades shall be repaired or replaced with new in

accordance with the manufacturer's design and arrangement for that particular unit when any part or section is worn as much as 10 percent below the original height of the manufacturer's design.

- (b) Stationary Mixers: These shall conform to the requirements of Article "Mixing and Mixing Equipment". Truck mixers mounted on a stationary base will not be considered as a stationary mixer.
- (c) Truck Mixers: In addition, truck mixers shall comply with the following requirements:

An engine in satisfactory working condition and capable of accurately gauging the desired speed of rotation shall be mounted as an integral part of the mixing unit for the purpose of rotating the drum. Truck mixers equipped with a transmission that will govern the speed of the drum within the specified revolutions per minute (rpm) will not require a separate engine.

All truck mixers shall be equipped with actuated counters by which the proper number of revolutions of the drum, as specified in Article 11. A. above, may be readily verified. The counters shall be read and recorded at the start of mixing at mixing speeds.

Each until shall have adequate water supply and accurate metering or gauging devices for measuring the amount used.

- (d) Agitators: Concrete agitators shall be of the truck type, capable of maintaining a thoroughly mixed and uniform concrete mass and discharging it within the same degree of uniformity specified for mixers. Agitators shall comply with all of the requirements for truck mixers, except for the actual mixing requirements.

C. Operation of Plant and Equipment.

Delivery of ready-mixed concrete shall equal or exceed the rate approved by the Engineer for continuous placement. In all cases, the delivery of concrete to the placement site shall assure compliance with the time limits in the applicable specification for depositing successive batches in any monolithic unit. The Contractor shall satisfy the Engineer that adequate standby trucks are available.

A standard ticket system will be used for recording concrete batching, mixing and delivery date.

Tickets will be delivered to the job inspector.

Loads arriving without ticket and/or in unsatisfactory condition shall not be used.

When a stationary mixer is used for the entire mixing operation, the mixing time for one cubic yard of concrete shall be one minute plus 15 seconds for each additional cubic yard or portion thereof. This mixing time shall start when all cement, aggregates and initial water have entered the drum.

The mixer shall be charged so that some of the mixing water will enter the drum in advance of the cement and aggregate. All of the mixing water shall be in the drum by the end of the first one-fourth of the specified mixing time. Water used to flush down the blades after charging shall be accurately measured and included in the quantity of mixing water. The introduction of the initial mixing water, except blade wash down water and that permitted in this Article, shall be prior to or simultaneous with the charging of the aggregates and cement.

The loading of truck mixers shall not exceed 63 percent of the total volume of the drum. When used as an agitator only, the loading shall not exceed 80 percent of the drum volume.

When Ready-Mix Concrete is used, additional mortar (one sack cement, three parts sand and sufficient water) shall be added to the batch to coat the drum of the mixer or agitator truck, and this shall be required for every load of Class C concrete only and for the first batch from central mix plants.

A portion of the mixing water, required by the batch design to produce the desired slump, may be withheld and added at the job site, but only with permission of the Engineer and under his supervision. When water is added under the above conditions, it shall be thoroughly mixed as specified below for water added at the job site.

Mixing speed shall be attained as soon as all ingredients are in the mixer, and each complete batch (containing all the required ingredients) shall be mixed not less than 70 nor more than 100 revolutions of the drum at mixing speed except that when water is added at the job site, 25 revolutions (minimum) at mixing speed will be required to uniformly disperse the additional water throughout the mix. Mixing speed shall be as designated by the manufacturer.

All revolutions after the prescribed mixing time shall be at agitating speed. The agitating speed shall be not less than one (1) nor more than five (5) rpm. The drum shall be kept in continuous motion from the time mixing is started until the discharge is completed.

12. PLACING, CURING AND FINISHING

The placing of concrete, including construction of forms and falsework, curing and finishing, shall be in accordance with City Standard Specification Section 038000 "Concrete Structures".

13. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, the quantities of concrete of the various classifications which will constitute the completed and accepted structure(s) in-place will be measured by the cubic yard, per each, square foot, square yard or linear foot, as the case may be. Measurement will be as shown on the drawings and/or in the Bid Form.

Payment shall be full compensation for furnishing, hauling, mixing, placing, curing and finishing all concrete; all grouting and pointing; furnishing and placing drains; furnishing and placing metal flashing strips; furnishing and placing expansion joint material required by this specification or shown on the plans; and for all forms and falsework, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 032020
REINFORCING STEEL

1. DESCRIPTION

This specification shall govern the furnishing and placing of reinforcing steel, deformed and smooth, of the size and quantity designated on the plans and in accordance with these specifications.

2. MATERIALS

Unless otherwise designated on the plans, all bar reinforcement shall be deformed, and shall conform to ASTM Designation: A 615, Grades 60 or 75, and shall be open hearth, basic oxygen, or electric furnace new billet steel.

Large diameter new billet steel (Nos. 14 and 18), Grade 75, will be permitted for straight bars only.

Where bending of bar sizes No. 14 or No. 18 of Grade 60 is required, bend testing shall be performed on representative specimens as described for smaller bars in the applicable ASTM Specification. The required bend shall be 90 degrees around a pin having a diameter of 10 times the nominal diameter of the bar.

Spiral reinforcement shall be smooth (not deformed) bars or wire of the minimum diameter shown on the plans, and shall be made by one or more of the following processes: open hearth, basic oxygen, or electric furnace. Bars shall be rolled from billets reduced from ingots and shall comply with ASTM Designation: A 306, Grade 65 minimum (references to ASTM Designation: A 29 is voided). Dimensional tolerances shall be in accordance with ASTM Designation: A 615, or ASTM Designation: A 615, Grade 60, except for deformations. Wire shall be cold-drawn from rods that have been hot-rolled from billets and shall comply with ASTM Designation: A 185.

In cases where the provisions of this specification are in conflict with the provisions of the ASTM Designation to which reference is made, the provisions of this specification shall govern.

Report of chemical analysis showing the percentages of carbon, manganese, phosphorus and sulphur will be required for all reinforcing steel when it is to be welded.

The nominal size and area and the theoretical weight of reinforcing steel bars covered by this specification are as follows:

<u>Bar Size Number</u>	<u>Nominal Diameter, In.</u>	<u>Nominal Area, Sq. In.</u>	<u>Weight per Linear Foot, Pounds</u>
2	0.250	0.05	0.167
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.6
18	2.257	4.00	13.60

Smooth round bars shall be designated by size number through No. 4. Smooth bars larger than No. 4 shall be designated by diameter in inches.

When wire is ordered by gauge numbers, the following relation between gauge number and diameter, in inches, shall apply unless otherwise specified:

<u>Gauge Number</u>	<u>Equivalent Diameter, Inches</u>	<u>Gauge Number</u>	<u>Equivalent Diameter, Inches</u>
0	0.3065	8	0.1620
1	0.2830	9	0.1483
2	0.2625	10	0.1350
3	0.2437	11	0.1205
4	0.2253	12	0.1055
5	0.2070	13	0.0915
6	0.1920	14	0.0800
7	0.1770		

3. BENDING

The reinforcement shall be bent cold, true to the shapes indicated on the plans. Bending shall preferably be done in the shop. Irregularities in bending shall be cause for rejection.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), shall be as follows:

Bends of 90 degrees and greater in stirrups, ties and other secondary bars that enclose another bar in the bend:

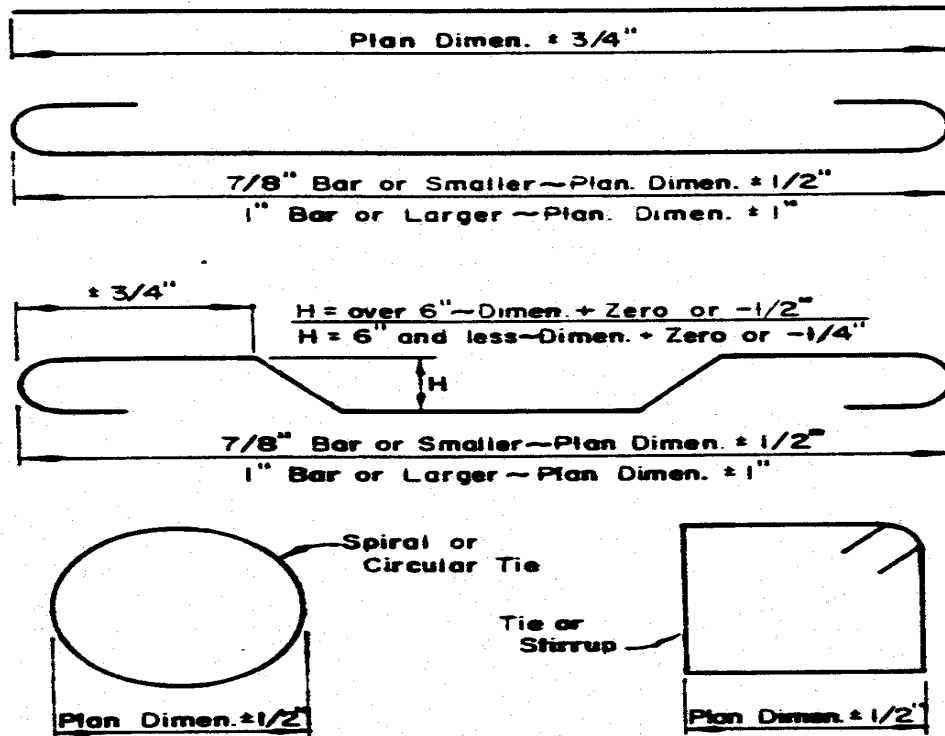
	<u>Grade 60</u>
#3, #4, #5	4d
#6, #7, #8	5d

All bends in main bars and in secondary bars not covered above:

	<u>Grade 60</u>	<u>Grade 75</u>
#3 thru #8	6d	--
#9, #10	8d	--
#11	8d	8d
#14, #18	10d	--

4. TOLERANCES

Fabricating tolerances for bars shall be within 3 percent of specified or as follows:



5. STORING

Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports, and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, paint, grease, oil, or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross-sectional area and tensile properties of a hand wire crushed specimen meets the physical requirements for size and grade of steel specified.

6. SPLICES

No splicing of bars, except when provided on the plans or specified herein, will be permitted without written approval of the Engineer.

Spllices will not be permitted in main reinforcement at points of maximum stress. When permitted in main bars, spllices in adjacent bars shall be staggered a minimum of two splice lengths.

TABLE 1
Minimum Lap Requirements

<u>Lap</u>		<u>Uncoated</u>	<u>Coated</u>
Lap in inches	≥	40d	60d

Where: d = bar diameter in inches

Welding of reinforcing bars may be used only where shown on the plans or as permitted herein. All welding operations, processes, equipment, materials, workmanship and inspection shall conform to the requirements of the drawings and industry standards. All splices shall be of such dimension and character as to develop the full strength of bar being spliced.

End preparation for butt welding reinforcing bars shall be done in the field. Delivered bars shall be of sufficient length to permit this practice.

For box culvert extensions with less than one foot of fill, the existing longitudinal bars shall have a 20-diameter lap with the new bars. For box culvert extensions with more than one foot of fill, a minimum of 6 inches lap will be required.

Unless otherwise shown on the plans, dowel bars transferring tensile stresses shall have a minimum embedment equal to the minimum lap requirements shown in Table 1. Shear transfer dowels shall have a minimum embedment of 12 inches.

7. PLACING

Reinforcement shall be placed as near as possible in the position shown on the plans. Unless otherwise shown on the plans, dimensions shown for reinforcement are to the centers of the bars. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than one-twelfth of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch. Cover of concrete to the nearest surface of steel shall meet the above requirements but shall never be less than one inch or as otherwise shown on the plans.

Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The reinforcing steel shall be spaced its required distance from the form surface by means of approved galvanized metal spacers, metal spacers with plastic coated tips, stainless steel spacers, plastic spacers, or approved pre-cast mortar or concrete blocks. For approval of plastic spacers on the project, representative samples of the plastic shall show no visible indications of deterioration after immersion in a 5 percent solution of sodium hydroxide for 120 hours.

All reinforcing steel shall be tied at all intersections, except that where spacing is less than one foot in each direction, alternate intersections only need be tied.

Before any concrete is placed, all mortar shall be cleaned from the reinforcement. Precast mortar or concrete blocks to be used for holding steel in position adjacent to formed surfaces shall be cast in molds meeting the approval of the Engineer and shall be cured by covering with wet burlap or

cotton mats for a period of 72 hours.

The blocks shall be cast in the form of a frustum of a cone or pyramid with the smaller face placed against the forms.

A suitable tie wire shall be provided in each block, to be used for anchoring to the steel. Except in unusual cases, and when specifically otherwise authorized by the Engineer, the size of the surface to be placed adjacent to the forms shall not exceed two and one-half inches square or the equivalent thereof in cases where circular or rectangular areas are provided. Blocks shall be cast accurately to the thickness required, and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.

Reinforcement shall be supported and tied in such manner that a sufficiently rigid case of steel is provided. If the cage is not adequately supported to resist settlement or floating upward of the steel, overturning of truss bars or movement in any direction during concrete placement, permission to continue concrete placement will be withheld until corrective measures are taken. Sufficient measurements shall be made during concrete placement to insure compliance with the first paragraph of Article 7 of this specification.

Mats of wire fabric shall overlap each other sufficiently to maintain a uniform strength and shall be fastened securely at the ends and edges.

No concrete shall be deposited until the Engineer has inspected the placement of the reinforcing steel and given permission to proceed.

8. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, reinforcing steel is considered subsidiary to the various items shown in the Bid Form and shall not be measured and paid for as a separate item.

SECTION 038000
CONCRETE STRUCTURES

1. DESCRIPTION

This specification shall govern for construction of all types of structures involving the use of structural concrete, except where the requirements are waived or revised by other governing specifications.

All concrete structures shall be constructed in accordance with the design requirements and details shown on the plans; in conformity with the pertinent provisions of the items contracted for; the incidental specifications referred to; and in conformity with the requirements herein.

2. MATERIALS

(1) Concrete. All concrete shall conform to the provisions of City Standard Specification Section 030020 "Portland Cement Concrete".

The class of concrete for each type of structure or unit shall be as specified on the plans or by pertinent governing specifications.

(2) Expansion Joint Material.

(a) Preformed Fiber Material. Preformed fiber expansion joint material shall be of the dimensions shown on the plans. The material shall be one of the following types, unless otherwise noted on the plans:

1. Preformed Bituminous Fiber Materials shall meet the requirements of ASTM Designation: D1751 "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)".
2. Preformed Non-Bituminous Fiber Material shall meet the requirements of ASTM Designation: D1751 "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)", except that the requirements pertaining to bitumen content, density and water absorption shall be voided.

3. Redwood.

(b) Joint Sealing Materials. Unless otherwise shown on the drawings, joint sealing material shall conform to the following requirements. The material shall adhere to the sides of the concrete joint or crack and shall form an effective seal against infiltration of water and incompressibles. The material shall not crack or break when exposed to low temperatures.

1. Class 1-a. (Two-Component, Synthetic Polymer, Cold-Extruded Type). Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles. This type is specifically designed for vertical or sloping joints and hence not self-leveling. It shall cure sufficiently at an average temperature of 77 degrees F \pm 3 degrees F in a maximum of 24 hours. For performance requirements see under 2.(2)(b)2. below.
2. Class 1-b. (Two-Component, Synthetic Polymer, Cold-Pourable, Self-Leveling Type). Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles. It shall cure sufficiently at an average temperature of 77 degrees F \pm 3 degrees F in a maximum of 3 hours.

Performance Requirements: Class 1-a and Class 1-b joint materials, when tested in accordance with TxDOT Test Method Tex-525-C, shall meet the above curing times and the following requirements:

It shall be of such consistency that it can be mixed and poured, or mixed and extruded into joints at temperatures above 60 degrees F.

Penetration, 77° F.:	
150 gm. cone, 5 sec., max., cm.....	0.90
Bond and Extension 75%, O° F, 5 cycles:	
Dry Concrete Blocks.....	Pass
Wet Concrete Blocks.....	Pass
Steel Blocks...(Primed if specified by manuf.).	Pass
Flow at 200° F.....	None
Water Content % by weight, max.....	5.0
Resilience:	
Original sample min. % (cured).....	50
Oven aged at 158° F min. %	50
For Class 1-a Material Only:	
Cold Flow (10 min.).....	None

(c) Asphalt Board. Asphalt Board shall consist of two liners of 0.016-inch asphalt impregnated paper, filled with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and sufficiently rigid to permit installation. When tested in accordance with TxDOT Test Method Tex-524-C, the asphalt board shall not deflect from the horizontal more than one inch in three and one-half inches (1" in 3½").

(d) Rebonded Neoprene Filler. Rebonded neoprene filler shall consist of ground closed-cell neoprene particles, rebonded and molded into sheets of uniform thickness, of the dimensions shown on plans.

Filler material shall have the following physical properties and shall meet the requirements of ASTM Designation: D1752 "Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction", Type 1, where applicable:

<u>PROPERTY</u>	<u>METHOD</u>	<u>REQUIREMENT</u>
Color	ASTM D1752, Type 1	Black
Density	ASTM D1752, Type 1	40 lb./ft ³ Min.
Recovery	ASTM D1752, Type 1	90% Min.
Compression	ASTM D1752, Type 1	50 to 500 psi
Extrusion	ASTM D1752, Type 1	0.25 inch Max.
Tensile Strength	ASTM D1752, Type 1	20 psi Min.
Elongation		75% Min.

The manufacturers shall furnish the Engineer with certified test results as to compliance with the above requirements and a 12 inch x 12 inch x 1 inch sample from the shipment for approval.

(3) Curing Materials.

(a) Membrane curing materials shall comply with ASTM Designation: C 309 "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete", Type 1 clear or translucent, or Type 2 white-pigmented. The material shall have a minimum flash-point of 80 degrees F when tested by the "Pensky-Martin Closed Cup Method".

It shall be of such consistency that it can be satisfactorily applied as a fine mist through an atomizing nozzle by means of approved pressure spraying equipment at atmospheric temperatures above 40 degrees F.

It shall be of such nature that it will not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete or its components. Type 1 compound shall contain a fugitive dye that will be distinctly visible not less than 4 hours nor more than 7 days after application. The compound shall produce a firm, continuous, uniform moisture impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface at the rate of coverage specified herein, be dry to the touch in not more than 4 hours, and shall adhere in a tenacious film without running off or appreciable sagging. It shall not disintegrate, check, peel or crack during the required curing period.

The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job only in the manufacturer's original containers, which shall be clearly labeled with the manufacturer's name, the trade name of the material, and a batch number or symbol with which test samples may be correlated.

The water retention test shall be in accordance with TxDOT Test Method Tex-219-F. Percentage loss shall be defined as the water lost after the application of the curing material was applied. The permissible percentage moisture loss (at the rate of coverage specified herein) shall not exceed the

following:

24 hours after application.....	2 percent
72 hours after application.....	4 percent

Type 1 (Resin Base Only) curing compound will be permitted for slab concrete in bridge decks and top slabs of direct traffic culverts.

(b) Mat curing of concrete is allowed where permitted by Table 1 in this specification or where otherwise approved by the Engineer.

3. EXPANSION JOINTS

Joints and devices to provide for expansion and contraction shall be constructed where and as indicated herein or on the plans.

All open joints and joints to be filled with expansion joint material, shall be constructed using forms adaptable to loosening or early removal. To avoid expansion or contraction damage to the adjacent concrete, these forms shall be loosened as soon as possible after final concrete set to permit free movement without requiring full form removal.

Prior to placing the sealing material, the vertical facing the joint shall be cleaned of all laitance by sandblasting or by mechanical routing. Cracked or spalled edges shall be repaired. The joint shall be blown clean of all foreign material and sealed. Where preformed fiber joint material is used, it shall be anchored to the concrete on one side of the joint by light wire or nails, to prevent the material from falling out. The top one inch (1") of the joint shall be filled with joint sealing material.

Finished joints shall conform to the indicated outline with the concrete sections completely separated by the specified opening or joint material.

Soon after form removal and again where necessary after surface finishing, all projecting concrete shall be removed along exposed edges to secure full effectiveness of the expansion joints.

4. CONSTRUCTION JOINTS

The joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set shall be deemed a construction joint. The term "monolithic placement" shall be interpreted to mean at the manner and sequence of concrete placing shall not create construction joints.

Construction joints shall be of the type and at the locations shown on the plans. Additional joints will not be permitted without written authorization from the Engineer, and when authorized, shall have details equivalent to those shown on the plans for joints in similar locations.

Unless otherwise provided, construction joints shall be square and normal to the forms. Bulkheads shall be provided in the forms for all joints, except when horizontal.

Construction joints requiring the use of joint sealing material shall be as detailed on the plans. The

material will be specified on the plans without referenced to joint type.

A concrete placement terminating at a horizontal construction joint shall have the top surface roughened thoroughly as soon as practicable after initial set is attained. The surfaces at bulkheads shall be roughened as soon as the forms are removed.

The hardened concrete surface shall be thoroughly cleaned of all loose material, laitance, dirt or foreign material, and saturated with water so it is moist when placing fresh concrete against it. Forms shall be drawn tight against the placing of the fresh concrete.

5. FORMS

(1) General. Except where otherwise specified, forms may be of either timber or metal.

Forms for round columns exposed to view shall be of steel, except that other materials will be allowed with written permission of the Engineer.

Forming plans shall be submitted to the Engineer for approval as specified. Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. For job fabricated forms, an additional live load of 50 pounds per square foot shall be allowed on horizontal surfaces. The maximum unit stresses shall not exceed 125 percent of the allowable stresses used by the Texas Department of Transportation for the design of structures.

Commercially produced structural units used in formwork shall not exceed the manufacturer's maximum allowable working load for moment, shear or end reaction. The maximum working load shall include a live load of 35 pounds per square foot of horizontal form surface, and sufficient details and data shall be submitted for use in checking formwork details for approval.

Forms shall be practically mortar-tight, rigidly braced and strong enough to prevent bulging between supports, and maintained to the proper line and grade during concrete placement. Forms shall be maintained in a manner that will prevent warping and shrinkage.

Offset at form joints shall not exceed one-sixteenth of an inch (1/16").

Deflections due to cast-in-place slab concrete and railing shown in the dead load deflection diagram shall be taken into account in the setting of slab forms.

All forms and footing areas shall be cleaned of any extraneous matter before placing concrete.

Permission to place concrete will not be given until all such work is completed to the satisfaction of the Engineer.

If, at any stage of the work, the forms show signs of bulging or sagging, the portion of the concrete causing such condition shall be removed immediately, if necessary, and the forms shall be reset and securely braced against further movement.

(2) Timber Forms. Lumber for forms shall be properly seasoned, of good quality, and free from imperfections which would affect its strength or impair the finished surface of the concrete. The lumber used for facing or sheathing shall be finished on at least one side and two edges and shall be sized to uniform thickness.

Form lining will be required for all formed surfaces, except for the inside of culvert barrels, inlets and manholes; surfaces that are subsequently covered by backfill material or are completely enclosed; and, any surface formed by a single finished board. Lining will not be required when plywood forms are used.

Form lining shall be of an approved type such as Masonite or plywood. Thin membrane sheeting, such as polyethylene sheets, shall not be used for form lining.

Forms may be constructed of plywood not less than one-half inch in thickness, with no form lining required. The grain of the face plies on plywood forms shall be placed parallel to the span between the supporting studs or joists.

Plywood used for forming surfaces that remain exposed shall be equal to that specified as B-B Plyform Class I or Class II Exterior, of the U. S. Department of Commerce, National Bureau of Standards and Technology, latest edition.

Forms or form lumber to be reused shall be maintained clean and in good condition. Any lumber which is split, warped, bulged, marred, or has defects that will produce inferior work, shall not be used and, if condemned, shall be promptly removed from the work.

Studs and joists shall be spaced so that the facing form material remains in true alignment under the imposed loads.

Wales shall be spaced close enough to hold forms securely to the designated lines and scabbed at least 4 feet on each side of joints to provide continuity. A row of wales shall be placed near the bottom of each placement.

Facing material shall be placed with parallel and square joints and securely fastened to supporting studs.

Forms for surfaces receiving only an ordinary finish and exposed to view shall be placed with the form panels symmetrical, i.e., long dimensions set in the same direction. Horizontal joints shall be continuous.

Molding specified for chamfer strips or other uses shall be made of materials of a grade that will not split when nailed and which can be maintained to a true line without warping. Wood molding shall be mill cut and dressed on all faces. Unless otherwise provided, forms shall be filleted at all sharp corners and edges with triangular chamfer strips measuring three-quarter inch (3/4") on the sides.

Forms for railing and ornamental work shall be constructed to standards equivalent to first-class millwork. All moldings, panel work and bevel strips shall be straight and true with nearly mitered joints designed so the finished work is true, sharp and clean cut.

All forms shall be constructed to permit their removal without marring or damaging the concrete. The forms may be given a slight draft to permit ease of removal.

Metal form ties of an approved type or a satisfactory substitute shall be used to hold forms in place and shall be of a type that permits ease of removal of the metal as hereinafter specified.

All metal appliances used inside of forms for alignment purposes shall be removed to a depth of at least one-half inch (1/2") from the concrete surface. They shall be made so the metal may be removed without undue chipping or spalling, and when removed, shall leave a smooth opening in the concrete surface. Burning off of rods, bolts or ties will not be permitted.

Any wire ties used shall be cut back at least one-half inch (1/2") from the face of the concrete.

Devices holding metal ties in place shall be capable of developing the strength of the tie and adjustable to allow for proper alignment.

Metal and wooden spreaders which are separate from the forms shall be removed entirely as the concrete is being placed.

Adequate clean-out openings shall be provided for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

Prior to placing concrete, the facing of all forms shall be treated with oil or other bond breaking coating of such composition that it will not discolor or otherwise injuriously affect the concrete surface. Care shall be exercised to prevent coating of the reinforcing steel.

(3) Metal Forms. The foregoing requirements for timber forms regarding design, mortar-tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse and wetting shall also apply to metal forms, except that these will not require lining, unless specifically noted on the plans.

The thickness of form metal shall be as required to maintain the true shape without warping or bulging. All bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or line up properly shall not be used. Metal shall be kept free from rust, grease or other foreign materials.

6. PLACING REINFORCEMENT

Reinforcement in concrete structures shall be placed carefully and accurately and rigidly supported as provided in the City Standard Specification Section 032020 "Reinforcing Steel". Reinforcing steel supports shall not be welded to I-beams or girders.

7. PLACING CONCRETE-GENERAL

The minimum temperature of all concrete at the time of placement shall be not less than 50 degrees F.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for finishing, the required water shall be applied to the surface by fog spray only, and shall be held to a minimum amount. Fog spray for this purpose may be applied with hand operated fogging equipment.

The maximum time interval between the addition of cement to the batch and the placing of concrete in the forms shall not exceed the following:

<u>Air or Concrete Temperature</u>	<u>Maximum Time</u>
<u>Non-Agitated Concrete:</u>	
Above 80 degrees F	15 minutes
Up to 80 degrees F	30 minutes
<u>Agitated Concrete:</u>	
Above 90 degrees F	45 minutes
75 degrees F to 90 degrees F	60 minutes
35 degrees F to 74 degrees F	90 minutes

The use of an approved retarding agent in the concrete will permit the extension of each of the above temperature-time maximums by 30 minutes for direct traffic culverts, and one hour for all other concrete except that the maximum time shall not exceed 30 minutes for non-agitated concrete.

Before starting work, the Contractor shall inform the Engineer fully of the construction methods he proposes to use, the adequacy of which shall be subject to the approval of the Engineer.

The Contractor shall give the Engineer sufficient advance notice before placing concrete in any unit of the structure to permit the inspection of forms, reinforcing steel placement, and other preparations. Concrete shall not be placed in any unit prior to the completion of formwork and placement of reinforcement therein.

Concrete mixing, placing and finishing shall be done during daylight hours, unless adequate provisions are made to light the entire site of all operations.

Concrete placement will not be permitted when impending weather conditions will impair the quality of the finished work. If rainfall should occur after placing operations are started, the Contractor shall provide ample covering to protect the work. In case of drop in temperature, the provisions set forth in Article "Placing Concrete in Cold Weather" of this specification shall be applied.

The placing of concrete shall be regulated so the pressures caused by the plastic concrete shall not exceed the loads used in form design.

The method of handling, placing and consolidation of concrete shall minimize segregation and displacement of the reinforcement, and produce a uniformly dense and compact mass. Concrete shall not have a free fall of more than 5 feet, except in the case of thin walls such as in culverts. Any hardened concrete spatter ahead of the plastic concrete shall be removed.

The method and equipment used to transport concrete to the forms shall be capable of maintaining the rate of placement approved by the Engineer. Concrete may be transported by buckets, chutes, buggies, belt conveyors, pumps or other acceptable methods.

When belt conveyors or pumps are used, sampling for testing will be done at the discharge end. Concrete transported by conveyors shall be protected from sun and wind, if necessary, to prevent loss of slump and workability. Pipes through which concrete is pumped shall be shaded and/or wrapped with wet burlap, if necessary, to prevent loss of slump and workability. Concrete shall not be transported through aluminum pipes, tubes or other aluminum equipment.

Chutes, troughs, conveyors or pipes shall be arranged and used so that the concrete ingredients will not be separated. When steep slopes are necessary, the chutes shall be equipped with baffle boards or made in short lengths that reverse the direction of movement, or the chute ends shall terminate in vertical downspouts. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in them. All transporting equipment shall be kept clean and free from hardened concrete coatings. Water used for cleaning shall be discharged clear of the concrete.

Each part of the forms shall be filled by depositing concrete as near its final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point and running or working it along the forms will not be allowed.

Concrete shall be deposited in the forms in layers of suitable depth but not more than 36 inches in thickness, unless otherwise directed by the Engineer.

The sequence of successive layers or adjacent portions of concrete shall be such that they can be vibrated into a homogenous mass with the previously placed concrete without a cold joint. Not more than one hour shall elapse between adjacent or successive placements of concrete. Unauthorized construction joints shall be avoided by placing all concrete between the authorized joints in one continuous operation.

An approved retarding agent shall be used to control stress cracks and/or unauthorized cold joints in mass placements where differential settlement and/or setting time may induce stress cracking.

Openings in forms shall be provided, if needed, for the removal of laitance of foreign matter of any kind.

All forms shall be wetted thoroughly before the concrete is placed therein.

All concrete shall be well consolidated and the mortar flushed to the form surfaces by continuous working with immersion type vibrators. Vibrators which operate by attachment to forms or reinforcement will not be permitted, except on steel forms. At least one stand-by vibrator shall be

provided for emergency use in addition to those required for placement.

The concrete shall be vibrated immediately after deposit. Prior to the beginning of work, a systematic spacing of the points of vibration shall be established to insure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. Immersion type vibrators shall be inserted vertically, at points 18 to 30 inches apart, and slowly withdrawn. The vibrator may be inserted in a sloping or horizontal position in shallow slabs. The entire depth of each lift shall be vibrated, allowing the vibrator to penetrate several inches into the preceding lift. Concrete along construction joints shall be thoroughly consolidated by operating the vibrator along and close to but not against the joint surface. The vibration shall continue until thorough consolidation, and complete embedment of reinforcement and fixtures is produced, but not long enough to cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

Slab concrete shall be mixed in a plant located off the structure. Carting or wheeling concrete batches over completed slabs will not be permitted until they have aged at least four (4) full curing days. If carts are used, timber planking will be required for the remainder of the curing period. Carts shall be equipped with pneumatic tires. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

After concrete has attained its initial set, at least one (1) curing day shall elapse before placing strain on projecting reinforcement to prevent damage to the concrete.

The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and, when permitted, shall be limited to quantities and distribution that will not induce excessive stresses.

8. PLACING CONCRETE IN COLD WEATHER

(1) Cast-in-Place Concrete. Concrete may be placed when the atmospheric temperature is not less than 35 degrees F. Concrete shall not be placed in contact with any material coated with frost or having a temperature less than 32 degrees F.

Aggregates shall be free from ice, frost and frozen lumps. When required, in order to produce the minimum specified concrete temperature, the aggregate and/or the water shall be heated uniformly, in accordance with the following:

The water temperature shall not exceed 180 degrees F, and/or the aggregate temperature shall not exceed 150 degrees F. The heating apparatus shall heat the mass of aggregate uniformly. The temperature of the mixture of aggregates and water shall be between 50 degrees F and 85 degrees F before introduction of the cement.

All concrete shall be effectively protected as follows:

(a) The temperature of slab concrete of all unformed surfaces shall be maintained at 50 degrees F or above for a period of 72 hours from time of placement and above 40 degrees F for an additional 72 hours.

(b) The temperature at the surface of all concrete in piers, culverts walls, retaining walls, parapets, wingwalls, bottoms of slabs, and other similar formed concrete shall be maintained at 40 degrees F or above for a period of 72 hours from time of placement.

(c) The temperature of all concrete, including the bottom slabs of culverts placed on or in the ground, shall be maintained above 32 degrees F for a period of 72 hours from time of placement.

Protection shall consist of providing additional covering, insulated forms or other means, and if necessary, supplementing such covering with artificial heating. Curing as specified under Article "Curing Concrete" of this specification shall be provided during this period until all requirements for curing have been satisfied.

When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand ready for use before permission is granted to begin placement.

Sufficient extra test specimens will be made and cured with the placement to ascertain the condition of the concrete as placed, prior to form removal and acceptance.

(2) Precast Concrete. A fabricating plant for precast products which has adequate protection from cold weather in the form of permanent or portable framework and covering, which protects the concrete when placed in the forms, and is equipped with approved steam curing facilities, may place concrete under any low temperature conditions provided:

(a) The framework and covering are placed and heat is provided for the concrete and the forms within one hour after the concrete is placed. This shall not be construed to be one hour after the last concrete is placed, but that no concrete shall remain unprotected longer than one hour.

(b) Steam heat shall keep the air surrounding the concrete between 50 degrees F and 85 degrees F for a minimum of three hours prior to beginning the temperature rise which is required for steam curing.

(c) For fabricating plants without the above facilities and for job site precast products, the requirements of the Article "Curing Concrete" of this specification shall apply.

The Contractor is responsible for the protection of concrete placed under any and all weather conditions. Permission given by the Engineer for placing concrete during freezing weather will in no way relieve the Contractor of the responsibility for producing concrete equal in quality to that placed under normal conditions. Should concrete placed under such conditions prove unsatisfactory, it shall be removed and replaced at no additional cost.

9. PLACING CONCRETE IN WATER

Concrete shall be deposited in water only when specified on the plans or with written permission by the Engineer. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping will not be permitted during the concrete placing, nor until it has set for at least 36 hours.

The concrete shall be placed with a tremie, closed bottom-dump bucket, or other approved method, and shall not be permitted to fall freely through the water nor shall it be disturbed after it has been placed. The concrete surface shall be kept approximately level during placement.

The tremie shall consist of a water-tight tube 14 inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow.

Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.

The placing operations shall be continuous until the work is complete.

10. PLACING CONCRETE IN BOX CULVERTS

In general, construction joints will be permitted only where shown on the plans.

Where the top slab and walls are placed monolithically in culverts more than 4 feet in clear height, an interval of not less than one (1) nor more than two (2) hours shall elapse before placing the top slab to allow for shrinkage in the wall concrete.

The base slab shall be finished accurately at the proper time to provide a smooth uniform surface. Top slabs which carry direct traffic shall be finished as specified for roadway slabs in Article "Finish of Roadway Slabs". Top slabs of fill type culverts shall be given a reasonably smooth float finish.

11. PLACING CONCRETE IN FOUNDATIONS AND SUBSTRUCTURE

Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the Engineer and permission has been given to proceed.

Placing of concrete footings upon seal concrete courses will be permitted after the caissons or cofferdams are free from water and the seal concrete course cleaned. Any necessary pumping or bailing during the concreting operation shall be done from a suitable sump located outside the forms.

All temporary wales or braces inside cofferdams or caissons shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints in footings or shafts.

When footings can be placed in a dry excavation without the use of cofferdams or caissons, forms may be omitted, if desired by the Contractor and approved by the Engineer, and the entire excavation filled with concrete to the elevation of the top of footing; in which case, measurement for payment will be based on the footing dimensions shown on the plans.

12. TREATMENT AND FINISHING OF HORIZONTAL SURFACES EXCEPT ROADWAY SLABS

All unformed upper surfaces shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification will not be permitted.

After the concrete has been struck off, the surface shall be floated with a suitable float. Sidewalks shall be given a wood float or broom finish, or may be striped with a brush, as specified by the Engineer. Other surfaces shall be wood float finished and striped with a fine brush leaving a fine-grained texture.

13. FINISH OF ROADWAY SLABS

As soon as the concrete has been placed and vibrated in a section of sufficient width to permit working, the surface shall be approximately leveled, struck off and screeded, carrying a slight excess of concrete ahead of the screed to insure filling of all low spots. The screed shall be designed rigid enough to hold true to shape and shall have sufficient adjustments to provide for the required camber. A vibrating screed may be used if heavy enough to prevent undue distortion. The screeds shall be provided with a metal edge.

Longitudinal screeds shall be moved across the concrete with a saw-like motion while their ends rest on headers or templates set true to the roadway grade or on the adjacent finished slab.

The surface of the concrete shall be screeded a sufficient number of times and at such intervals to produce a uniform surface, true to grade and free of voids.

If necessary, the screeded surface shall be worked to smooth finish with a long handled wood or metal float of the proper size, or hand floated from bridges over the slab.

When required by the Engineer, the Contractor shall perform sufficient checks with a long handled 10-foot straightedge on the plastic concrete to insure that the final surface will be within the tolerances specified below. The check shall be made with the straightedge parallel to the centerline. Each pass thereof shall lap half of the preceding pass. All high spots shall be removed and all depressions over one-sixteenth inch (1/16") in depth shall be filled with fresh concrete and floated. The checking and floating shall be continued until the surface is true to grade and free of depressions, high spots, voids or rough spots.

Rail support holes shall be filled with concrete and finished to match the top of the slab.

Surface Texturing.

Perform surface texturing using a either carpet drag or metal tining as indicated on the drawings. Complete final texturing before the concrete has attained its initial set. Draw the carpet drag

longitudinally along the pavement surface with the carpet contact surface area adjusted to provide a satisfactory coarsely textured surface. A metal-tine texture finish is required using a tining machine unless otherwise shown on the plans. Provide the metal-tine finish immediately after the concrete surface has set enough for consistent tining. Operate the metal-tine device to obtain grooves spaced at 1 in., approximately 3/16 in. deep, with a minimum depth of 1/8 in., and approximately 1/12 in. wide. Do not overlap a previously tined area. Use manual methods for achieving similar results on ramps and other irregular sections of pavements. Repair damage to the edge of the slab and joints immediately after texturing. Do not tine pavement that will be overlaid.

Upon completion of the floating and/or straight edging and before the disappearance of the moisture sheen, the surface shall be given a broom or burlap drag finish. The grooves of these finishes shall be parallel to the structure centerline. It is the intent that the average texture depth resulting from the number of tests directed by the Engineer be not less than 0.035 inch with a minimum texture depth of 0.030 inch for any one test when tested in accordance with TxDOT Test Method Tex-436-A. Should the texture depth fall below that intended, the finishing procedures shall be revised to produce the desired texture.

After the concrete has attained its final set, the roadway surface shall be tested with a standard 10-foot straightedge. The straightedge shall be placed parallel to the centerline of roadway to bridge any depressions and touch high spots. Ordinates of irregularities measured from the face of the straightedge to the surface of the slab shall not exceed one-eighth of an inch (1/8"), making proper allowances for camber, vertical curvature and surface texture. Occasional variations, not exceeding three-sixteenth of an inch (3/16") will be acceptable, if in the opinion of the Engineer it will not affect the riding qualities.

When directed by the Engineer, irregularities exceeding the above requirements shall be corrected.

In all roadway slab finishing operations, camber for specified vertical curvature and transverse slopes shall be provided.

14. CURING CONCRETE

The Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide the proper equipment and material in adequate amounts; and shall have the proposed methods, equipment and material approved prior to placing concrete.

Inadequate curing and/or facilities, therefore, shall be cause for the Engineer to stop all construction on the job until remedial action is taken. All concrete shall be cured for a period of four (4) curing days except as noted herein.

EXCEPTIONS TO 4-DAY CURING

<u>Description</u>	<u>Required Curing</u>
Upper Surfaces of Bridge Slabs and Top Slabs of Direct Traffic Culverts	8 curing days (Type I or III) cement 10 curing days (Type II cement)
Concrete Piling (non-prestressed)	6 curing days

When the air temperature is expected to drop below 35 degrees F, the water curing mats shall be covered with polyethylene sheeting, burlap-polyethylene blankets or other material to provide the protection required by Article "Placing Concrete in Cold Weather" of these specifications.

A curing day is defined as a calendar day when the temperature, taken in the shade away from artificial heat, is above 50 degrees F for at least 19 hours (colder days if satisfactory provisions are made to maintain the temperature of all surfaces of the concrete above 40 degrees F for the entire 24 hours). The required curing period shall begin when all concrete therein has attained its initial set.

The following methods are permitted for curing concrete subject to the restrictions of Table 1 and the following requirements for each method of curing.

(1) Form Curing. When forms are left in contact with the concrete, other curing methods will not be required except for cold weather protection.

(2) Water Curing. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet the requirements for concrete mixing water as specified in the specification Section 030020 "Portland Cement Concrete". Seawater will not be permitted. Water which stains or leaves an unsightly residue shall not be used.

(a) Wet Mat. Cotton mats shall be used for this curing method. They shall be placed as soon as possible after the surface has sufficiently hardened to prevent damage to the concrete. (See Article, "Placing Concrete" of this specification.) Damp burlap blankets made from nine-ounce stock may be placed on the damp concrete surface for temporary protection prior to the application of the cotton mats which may be placed dry and wetted down after placement.

The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces which cannot be cured by contact shall be enclosed with mats and anchored positively to the forms or to the ground so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.

(b) Water Spray. This curing method shall consist of overlapping sprays or sprinklers that keep all unformed surfaces continuously wet.

(c) Ponding. This curing method requires the covering of the surfaces with a minimum of two inches (2") of clean granular material, kept wet at all times, or a minimum of one-inch

(1") depth of water. Satisfactory provisions shall be made to provide a dam to retain the water or saturated granular material.

(3) Membrane Curing. This consists of curing concrete pavement, concrete pavement (base), curbs, gutters, retards, sidewalks, driveways, medians, islands, concrete riprap, cement-stabilized riprap, concrete structures and other concrete as indicated on the plans by impervious membrane method.

Unless otherwise provided herein or shown on the plans, either Type 1-D or Type 2 membrane curing compound may be used where permitted except that Type 1-D (Resin Base Only) will be required for slab concrete in bridge decks and top slabs of direct traffic culverts.

TABLE 1

		<u>REQUIRED</u>		<u>PERMITTED</u>	
	<u>STRUCTURE UNIT DESCRIPTION</u>	<u>WATER FOR CURING</u>	<u>MEMBRANE FOR INTERIM CURING</u>	<u>WATER FOR CURING</u>	<u>MEMBRANE FOR INTERIM CURING</u>
1	Top slabs of direct traffic culverts	X	X		
2	Top surface of any concrete unit upon which concrete is to be placed and bonded at a later interval (Stub walls, risers, etc.). Other superstructure concrete (wing walls, parapet walls, etc.)	X			
3	Concrete pavement (base), curbs, gutters, retards, sidewalks, driveways, medians, islands, concrete structures, concrete riprap, etc.			X*	X*
4	All substructure concrete, culverts, box sewers, inlets, manholes, retaining walls			X*	X*

*Polyethylene sheeting, burlap-polyethylene mats or laminated mats to prevent outside air from entering will be considered equivalent to water or membrane curing for items 3 and 4.

Membrane curing shall not be applied to dry surfaces, but shall be applied just after free moisture has disappeared. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.

When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane which is damaged shall be corrected immediately by reapplication of membrane. Unless otherwise noted herein or on the plans, the choice of membrane type shall be at the option of the Contractor. Only one type of curing compound will be permitted on any one structure.

The membrane curing compound shall be applied after the surface finishing has been completed, and immediately after the free surface moisture has disappeared. The surface shall be sealed with a single uniform coating of curing compound applied at the rate of coverage recommended by the manufacturer and directed by the Engineer, but not less than 1 gallon per 180 square feet of area. The Contractor shall provide satisfactory means and facilities to properly control and check the rate of application of the compound.

The compound shall be thoroughly agitated during its use and shall be applied by means of approved mechanical power pressure sprayers. The sprayers used to apply the membrane to concrete pavement or concrete pavement (base) shall travel at uniform speed along the forms and be mechanically driven. The equipment shall be of such design that it will insure uniform and even application of the membrane material. The sprayers shall be equipped with satisfactory atomizing nozzles. Only on small miscellaneous items will the Contractor be permitted to use hand-powered spray equipment. For all spraying equipment, the Contractor shall provide facilities to prevent the loss of the compound between the nozzle and the concrete surface during the spraying operations.

The compounds shall not be applied to a dry surface. If the surface of the concrete has become dry, it shall be moistened prior to application of membrane by fogging or mist application. Sprinkling or coarse spraying will not be allowed.

At locations where the coating shows discontinuities, pinholes or other defects, or if rain falls on the newly-coated surface before the film has dried sufficiently to resist damage, an additional coat of the compound shall be applied immediately at the same rate of coverage specified herein.

To insure proper coverage, the Engineer shall inspect all treated areas after application of the compound for the period of time designated in the governing specification for curing, either for membrane curing or for other methods. Should the foregoing indicate that any area during the curing period is not protected, an additional coat or coats of the compound shall be applied immediately, and the rate of application of the membrane compound shall be increased until all areas are uniformly covered.

When temperatures are such as to warrant protection against freezing, curing by this method shall be supplemented with an approved insulating material capable of protecting the concrete for the specified curing period.

If at any time there is reason to believe that this method of curing is unsatisfactory or is detrimental

to the work, the Contractor, when notified, shall immediately cease the use of this method and shall change to curing by one of the other methods specified under this contract.

15. REMOVAL OF FORMS

Except as herein provided, forms for vertical surfaces may be removed when the concrete has aged not less than one day (24 hours) when Type I and Type II cement is used, and not less than one-half day (12 hours) when Type III cement is used, provided it can be done without damage to the concrete.

Forms for inside curb faces may be removed in approximately three hours provided it can be done without damage to the curb.

16. FINISHING EXPOSED SURFACES

Concrete shall be finished as required in the specification Section for the respective item or as otherwise specified on the plans.

An ordinary surface finish shall be applied to all concrete surfaces either as a final finish or preparatory to a higher finish.

Ordinary Surface Finish shall be as follows:

After form removal, all porous or honey-combed areas and spalled areas shall be corrected by chipping away all loose or broken material to sound concrete.

Feather edges shall be eliminated by cutting a face perpendicular to the surface. Shallow cavities shall be repaired using adhesive grout or epoxy grout. If judged repairable by the Engineer, large defective areas shall be corrected using concrete or other material approved by the Engineer.

Holes and spalls caused by removal of metal ties, etc., shall be cleaned and filled with adhesive grout or epoxy grout. Exposed parts of metal chairs on surfaces to be finished by rubbing, shall be chipped out to a depth of one-half inch (1/2") and the surface repaired.

All fins, runs, drips or mortar shall be removed from surfaces which remain exposed. Form marks and chamfer edges shall be smoothed by grinding and/or dry rubbing.

Grease, oil, dirt, curing compound, etc., shall be removed from surfaces requiring a higher grade of finish. Discolorations resulting from spillage or splashing of asphalt, paint or other similar material shall be removed.

Repairs shall be dense, well bonded and properly cured, and when made on surfaces which remain exposed and do not require a higher finish, shall be finished to blend with the surrounding concrete.

17. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, no direct measurement or payment will be made for the work to be done or the equipment to be furnished under this specification, but it shall be considered subsidiary to the particular items required by the plans and the contract documents.

SECTION 055420
FRAMES, GRATES, RINGS AND COVERS

1. DESCRIPTION

This specification shall govern for the furnishing and installation of frames, grates, rings and covers for inlets, manholes and other structures in accordance with those details. Steel shall conform to the requirements of ASTM Designation: A36 "Standard Specification for Carbon Structural Steel".

2. MATERIALS

Welded steel grates and frames shall conform to the member size, dimensions and details shown on the plans and shall be welded into an assembly in accordance with those details. Steel shall conform to the requirements of ASTM Designation: A36.

Castings, whether Carbon-Steel, Gray Cast Iron or Ductile Iron, shall conform to the shape and dimensions shown on the plans and shall be clean substantial castings, free from burnt-on sand or blow holes, and shall be reasonable smooth. Runners, risers, fins, and other cast-on pieces shall be removed from the castings and such areas ground smooth. Bearing surfaces between manhole rings and covers or grates and frames shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter contact area. Pairs of machined castings shall be matchmarked to facilitate subsequent identification at installation.

Steel castings shall conform to the requirements of ASTM Designation: A27 "Standard Specification for Steel Castings, Carbon, for General Application". Grade 70-36 shall be furnished unless otherwise specified.

Cast Iron castings shall conform to the requirements of ASTM Designation: A48 "Standard Specification for Gray Iron Castings", Class 30.

Ductile iron castings shall conform to the requirements of ASTM Designation: A536 "Standard Specification for Ductile Iron Castings". Grade 60-40-18 shall be used otherwise specified.

3. CONSTRUCTION METHODS

Frames, grates, rings and covers shall be constructed of the materials as specified and in accordance with the details shown on the plans, and shall be placed carefully to the lines and grades indicated on the plans or as directed by the Engineer.

All welding shall conform to the requirements of the latest American Welding Society Specifications. Frames, grates, rings and covers shall be given one coat of a commercial grade red lead and oil paint and two coats of commercial grade aluminum paint.

Painting on gray iron castings will not be required, except when used in conjunction with structural steel shapes.

Commercial grade galvanized bolts and nuts shall be used. The zinc coating shall be uniform in thickness, smooth and continuous.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, frames, grates, rings and covers will not be measured for payment, but shall be considered subsidiary to other bid items.

Item 506

Temporary Erosion, Sedimentation, and Environmental Controls



1. DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SWP3) on the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000. Control measures are defined as Best Management Practices used to prevent or reduce the discharge of pollutants. Control measures include, but are not limited to, rock filter dams, temporary pipe slope drains, temporary paved flumes, construction exits, earthwork for erosion control, pipe, construction perimeter fence, sandbags, temporary sediment control fence, biodegradable erosion control logs, vertical tracking, temporary or permanent seeding, and other measures. Erosion and sediment control devices must be selected from the *Erosion Control Approved Products* or *Sediment Control Approved Products* lists. Perform work in a manner to prevent degradation of receiving waters, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures is performed in accordance with the manufacturer's or designer's specifications.

Provide the Contractor Certification of Compliance before performing SWP3 or soil disturbing activities. By signing the Contractor Certification of Compliance, the Contractor certifies they have read and understand the requirements applicable to this project pertaining to the SWP3, the plans, and the TPDES General Permit TXR150000. The Contractor is responsible for any penalties associated with non-performance of installation or maintenance activities required for compliance. Ensure the most current version of the certificate is executed for this project.

2. MATERIALS

Furnish materials in accordance with the following:

- Item 161, "Compost,"
- Item 432, "Riprap," and
- Item 556, "Pipe Underdrains."

2.1. Rock Filter Dams.

2.1.1. **Aggregate.** Furnish aggregate with approved hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding. Provide the following:

- Types 1, 2, and 4 Rock Filter Dams. Use 3 to 6 in. aggregate.
- Type 3 Rock Filter Dams. Use 4 to 8 in. aggregate.

2.1.2. **Wire.** Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

- a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 × 3-1/4 in.;
- minimum 0.0866 in. steel wire for netting;
- minimum 0.1063 in. steel wire for selvages and corners; and
- minimum 0.0866 in. for binding or tie wire.

2.1.3. **Sandbag Material.** Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

- 2.2. **Temporary Pipe Slope Drains.** Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.
- Furnish concrete in accordance with Item 432, "Riprap."
- 2.3. **Temporary Paved Flumes.** Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.
- 2.4. **Construction Exits.** Provide materials that meet the details shown on the plans and this Section.
- 2.4.1. **Rock Construction Exit.** Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1. Use 2- to 4-in. aggregate for Type 3.
- 2.4.2. **Timber Construction Exit.** Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least 1/2 in. thick for short-term exits.
- 2.4.3. **Foundation Course.** Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.
- 2.5. **Embankment for Erosion Control.** Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.
- 2.6. **Pipe.** Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.
- 2.7. **Construction Perimeter Fence.**
- 2.7.1. **Posts.** Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in., or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.
- 2.7.2. **Fence.** Provide orange construction fencing as approved.
- 2.7.3. **Fence Wire.** Provide 14 gauge or larger galvanized smooth or twisted wire. Provide 16 gauge or larger tie wire.
- 2.7.4. **Flagging.** Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.
- 2.7.5. **Staples.** Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.
- 2.7.6. **Used Materials.** Previously used materials meeting the applicable requirements may be used if approved.
- 2.8. **Sandbags.** Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1
Sand Gradation

Sieve Size	Retained (% by Weight)
#4	Maximum 3%
#100	Minimum 80%
#200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size must not exceed 3/8 in.

- 2.9. **Temporary Sediment Control Fence.** Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.
- 2.9.1. **Fabric.** Provide fabric materials in accordance with [DMS-6230](#), "Temporary Sediment Control Fence Fabric."
- 2.9.2. **Posts.** Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans. Furnish soft wood posts at least 3 in. in diameter, or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.
- 2.9.3. **Net Reinforcement.** Provide net reinforcement of at least 12.5 gauge (SWG) galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.
- 2.9.4. **Staples.** Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.
- 2.9.5. **Used Materials.** Use recycled material meeting the applicable requirements if approved.
- 2.10. **Biodegradable Erosion Control Logs.**
- 2.10.1. **Core Material.** Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161, "Compost."
- 2.10.2. **Containment Mesh.** Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.
- Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.
- Furnish recyclable containment mesh for temporary installations.
- 2.10.3. **Size.** Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

3. QUALIFICATIONS, TRAINING, AND EMPLOYEE REQUIREMENTS

- 3.1. **Contractor Responsible Person Environmental (CRPE) Qualifications and Responsibilities.** Provide and designate in writing at the preconstruction conference a CRPE and alternate CRPE who have overall responsibility for the storm water management program. The CRPE will implement storm water and erosion control practices; will oversee and observe storm water control measure monitoring and management; will monitor the project site daily and produce daily monitoring reports as long as there are BMPs in place or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or on contract non-work days, daily inspections are not required unless a rain event has occurred. The CRPE will provide recommendations on how to improve the effectiveness of control measures. Attend the Department's preconstruction conference

for the project. Ensure training is completed as identified in Section 506.3.3., "Training," by all applicable personnel before employees work on the project. Document and submit a list, signed by the CRPE, of all applicable Contractor and subcontractor employees who have completed the training. Include the employee's name, the training course name, and date the employee completed the training. Provide the most current list at the preconstruction conference or before SWP3 or soil disturbing activities. Update the list as needed and provide the updated list when updated.

- 3.2. **Contractor Superintendent Qualifications and Responsibilities.** Provide a superintendent that is competent, has experience with and knowledge of storm water management, and is knowledgeable of the requirements and the conditions of the TPDES General Permit TXR150000. The superintendent will manage and oversee the day to day operations and activities at the project site; work with the CRPE to provide effective storm water management at the project site; represent and act on behalf of the Contractor; and attend the Department's preconstruction conference for the project.
- 3.3. **Training.** All Contractor and subcontractor employees involved in soil disturbing activities, small or large structures, storm water control measures, and seeding activities must complete training as prescribed by the Department.

4. CONSTRUCTION

- 4.1. **Contractor Responsibilities.** Implement the SWP3 for the project site in accordance with the plans and specifications, TPDES General Permit TXR150000, and as directed. Coordinate storm water management with all other work on the project. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Department's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.
- 4.2. **Implementation.** The CRPE, or alternate CRPE, must be accessible by phone and able to respond to project-related storm water management or other environmental emergencies 24 hr. per day.
 - 4.2.1. **Commencement.** Implement the SWP3 as shown and as directed. Contractor-proposed recommendations for changes will be allowed as approved. Conform to the established guidelines in the TPDES General Permit TXR150000 to make changes. Do not implement changes until approval has been received and changes have been incorporated into the plans. Minor adjustments to meet field conditions are allowed and will be recorded in the SWP3.
 - 4.2.2. **Phasing.** Implement control measures before the commencement of activities that result in soil disturbance. Phase and minimize the soil disturbance to the areas shown on the plans. Coordinate temporary control measures with permanent control measures and all other work activities on the project to assure economical, effective, safe, and continuous water pollution prevention. Provide control measures that are appropriate to the construction means, methods, and sequencing allowed by the Contract. Exercise precaution throughout the life of the project to prevent pollution of ground waters and surface waters. Schedule and perform clearing and grubbing operations so that stabilization measures will follow immediately thereafter if project conditions permit. Bring all grading sections to final grade as soon as possible and implement temporary and permanent control measures at the earliest time possible. Implement temporary control measures when required by the TPDES General Permit TXR150000 or otherwise necessitated by project conditions.

Do not prolong final grading and shaping. Preserve vegetation where possible throughout the project, and minimize clearing, grubbing, and excavation within stream banks, bed, and approach sections.
- 4.3. **General.**
 - 4.3.1. **Temporary Alterations or Control Measure Removal.** Altering or removal of control measures is allowed when control measures are restored within the same working day.

- 4.3.2. **Stabilization.** Initiate stabilization for disturbed areas no more than 14 days after the construction activities in that portion of the site have temporarily or permanently ceased. Establish a uniform vegetative cover or use another stabilization practice in accordance with the TPDES General Permit TXR150000.
- 4.3.3. **Finished Work.** Remove and dispose of all temporary control measures upon acceptance of vegetative cover or other stabilization practice unless otherwise directed. Complete soil disturbing activities and establish a uniform perennial vegetative cover. A project will not be considered for acceptance until a vegetative cover of 70% density of existing adjacent undisturbed areas is obtained or equivalent permanent stabilization is obtained in accordance with the TPDES General Permit TXR150000. An exception will be allowed in arid areas as defined in the TPDES General Permit TXR150000.
- 4.3.4. **Restricted Activities and Required Precautions.** Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in the TPDES General Permit TXR150000. Use appropriate controls to minimize the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e., dewatering). Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.
- 4.4. **Installation, Maintenance, and Removal Work.** Perform work in accordance with the SWP3, according to manufacturers' guidelines, and in accordance with the TPDES General Permit TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as approved.

The Department will inspect and document the condition of the control measures at the frequency shown on the plans and will provide the Construction SWP3 Field Inspection and Maintenance Reports to the Contractor. Make corrections as soon as possible before the next anticipated rain event or within 7 calendar days after being able to enter the worksite for each control measure. The only acceptable reason for not accomplishing the corrections with the time frame specified is when site conditions are "Too Wet to Work." Take immediate action if a correction is deemed critical as directed. When corrections are not made within the established time frame, all work will cease on the project and time charges will continue while the control measures are brought into compliance. Commence work once the Engineer reviews and documents the project is in compliance. Commencing work does not release the Contractor of the liability for noncompliance of the SWP3, plans, or TPDES General Permit TXR150000.

The Engineer may limit the disturbed area if the Contractor cannot control soil erosion and sedimentation resulting from the Contractor's operations. Implement additional controls as directed.

Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.

- 4.4.1. **Rock Filter Dams for Erosion Control.** Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings for Types 2 and 3, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria unless otherwise shown on the plans:

- 4.4.1.1. **Type 1 (Non-Reinforced).**
- **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.
 - **Top Width.** At least 2 ft.
 - **Slopes.** No steeper than 2:1.
- 4.4.1.2. **Type 2 (Reinforced).**
- **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.
 - **Top Width.** At least 2 ft.
 - **Slopes.** No steeper than 2:1.
- 4.4.1.3. **Type 3 (Reinforced).**
- **Height.** At least 36 in. measured vertically from existing ground to top of filter dam.
 - **Top Width.** At least 2 ft.
 - **Slopes.** No steeper than 2:1.
- 4.4.1.4. **Type 4 (Sack Gabions).** Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single loop—double loop pattern on 4- to 5-in. spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist 4 times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times.
- Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.
- Lift and place without damaging the gabion. Shape sack gabions to existing contours.
- 4.4.1.5. **Type 5.** Provide rock filter dams as shown on the plans.
- 4.4.2. **Temporary Pipe Slope Drains.** Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, "Riprap," when designated on the plans.
- 4.4.3. **Temporary Paved Flumes.** Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.
- 4.4.4. **Construction Exits.** Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long- or short-term use.
- 4.4.4.1. **Long-Term.** Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.
- 4.4.4.1.1. **Type 1.** Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.
- 4.4.4.1.2. **Type 2.** Construct using railroad ties and timbers as shown on the plans or as directed.

- 4.4.4.2. **Short-Term.**
- 4.4.4.2.1. **Type 3.** Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.
- 4.4.4.2.2. **Type 4.** Construct as shown on the plans or as directed.
- 4.4.5. **Earthwork for Erosion Control.** Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.
- 4.4.5.1. **Excavation and Embankment for Erosion Control Features.** Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.
- Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.
- 4.4.5.2. **Excavation of Sediment and Debris.** Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.
- 4.4.6. **Construction Perimeter Fence.** Construct, align, and locate fencing as shown on the plans or as directed.
- 4.4.6.1. **Installation of Posts.** Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.
- 4.4.6.2. **Wire Attachment.** Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.
- 4.4.6.3. **Flag Attachment.** Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.
- 4.4.7. **Sandbags for Erosion Control.** Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.
- 4.4.8. **Temporary Sediment-Control Fence.** Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.
- 4.4.8.1. **Installation of Posts.** Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the runoff source.
- 4.4.8.2. **Fabric Anchoring.** Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 × 6 in. Place the fabric against the side of the trench and align approximately 2 in. of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.
- 4.4.8.3. **Fabric and Net Reinforcement Attachment.** Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced unless otherwise shown on the plans. Sewn

vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

- 4.4.8.4. **Fabric and Net Splices.** Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment-control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.

- 4.4.9. **Biodegradable Erosion Control Logs.** Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown on the plans, or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

- 4.4.10. **Vertical Tracking.** Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring a minimum of 12 in. long × 2 to 4 in. wide × 1/2 to 2 in. deep. Do not exceed 12 in. between track impressions. Install continuous linear track impressions where the 12 in. length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred unless otherwise approved.

- 4.5. **Monitoring and Documentation.** Monitor the control measures on a daily basis as long as there are BMPs in place and/or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or contract non-work days, daily inspections are not required unless a rain event has occurred. Monitoring will consist of, but is not limited to, observing, inspecting, and documenting site locations with control measures and discharge points to provide maintenance and inspection of controls as described in the SWP3. Keep written records of daily monitoring. Document in the daily monitoring report the control measure condition, the date of inspection, required corrective actions, responsible person for making the corrections, and the date corrective actions were completed. Maintain records of all monitoring reports at the project site or at an approved place. Provide copies within 7 days. Together, the CRPE and an Engineer's representative will complete the Construction Stage Gate Checklist on a periodic basis as directed.

5. MEASUREMENT

(UNLESS OTHERWISE SPECIFIED ON THE BID FORM, MEASUREMENT SHALL BE AS STATED BELOW)

- 5.1. **Rock Filter Dams.** Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.
- 5.1.1. **Linear Measurement.** When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.
- 5.1.2. **Volume Measurement.** When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.
- 5.1.2.1. **Installation.** Measurement will be made in final position.

- 5.1.2.2. **Removal.** Measurement will be made at the point of removal.
- 5.2. **Temporary Pipe Slope Drains.** Temporary pipe slope drains will be measured by the foot.
- 5.3. **Temporary Paved Flumes.** Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.
- 5.4. **Construction Exits.** Construction exits will be measured by the square yard of surface area.
- 5.5. **Earthwork for Erosion and Sediment Control.**
- 5.5.1. **Equipment and Labor Measurement.** Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.
- 5.5.2. **Volume Measurement.**
- 5.5.2.1. **In Place.**
- 5.5.2.1.1. **Excavation.** Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.
- 5.5.2.1.2. **Embankment.** Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:
- the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
 - the lines, grades and slopes of the accepted embankment for the feature.
- 5.5.2.2. **In Vehicles.** Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.
- 5.6. **Construction Perimeter Fence.** Construction perimeter fence will be measured by the foot.
- 5.7. **Sandbags for Erosion Control.** Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.
- 5.8. **Temporary Sediment-Control Fence.** Installation or removal of temporary sediment-control fence will be measured by the foot.
- 5.9. **Biodegradable Erosion Control Logs.** Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.
- 5.10. **Vertical Tracking.** Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

6. PAYMENT

(UNLESS OTHERWISE SPECIFIED ON THE BID FORM, PAYMENT SHALL BE AS STATED BELOW)

The following will not be paid for directly but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter, unless a separate pay item is shown on the plans;

- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;
- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items except vertical tacking which is subsidiary.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

- 6.1. **Rock Filter Dams.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

- 6.1.1. **Installation.** Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

- 6.1.2. **Removal.** Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

- 6.2. **Temporary Pipe Slope Drains.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

- 6.3. **Temporary Paved Flumes.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

- 6.4. **Construction Exits.** Contractor-required construction exits from off right of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

- 6.5. **Earthwork for Erosion and Sediment Control.**

- 6.5.1. **Initial Earthwork for Erosion and Sediment Control.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Excavation (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment including hauling, disposal of material not used elsewhere on the project; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

- 6.5.2. **Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control Measures.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to the Engineer.

This price is full compensation for excavation, embankment, and re-grading including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

- 6.6. **Construction Perimeter Fence.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and

replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

- 6.7. **Sandbags for Erosion Control.** Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.
- Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.
- 6.8. **Temporary Sediment-Control Fence.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 6.8.1. **Installation.** Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.
- 6.8.2. **Removal.** Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 6.9. **Biodegradable Erosion Control Logs.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 6.9.1. **Installation.** Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.
- 6.9.2. **Removal.** Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 6.10. **Vertical Tracking.** Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.