



**REQUEST FOR
PROPOSALS**

**CITY OF EDINBURG – SOUTH EAST ORIGINAL TOWNSITE
DRAINAGE IMPROVEMENTS**

RFP #2019-08

RFP DUE DATE: Monday, November 19, 2018

RFP DUE TIME: 3:00 p.m.



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The City of Edinburg is soliciting sealed Request for Proposals; hereinafter referred to as RFP, to be received by the City Secretary's Office located at 415 W. University Drive, Edinburg, Texas 78541. City of Edinburg normal business days are Monday through Friday between the hours of 8:00 a.m. to 5:00 p.m. and shall be closed on recognized holidays.

RFP'S will be received until **3:00 p.m. Central Time**, on **Monday, November 19, 2018**, shortly thereafter all submitted RFP'S will be gathered and taken to the Edinburg City Hall Community Room, 1st Floor, to be publicly opened and read aloud. Any RFP received after the closing time will not be accepted and will be returned to the submitter unopened. It is the responsibility of the submitter to see that any RFP submitted shall have sufficient time to be received by the City Secretary's Office prior to the RFP opening date and time. The receiving time in the City Secretary's Office will be the governing time for acceptability of the RFP's. RFP's will not be accepted by telephone or facsimile machine. All RFP'S must bear original signatures and figures. The RFP shall be for:

RFP #2019-08
South East Original Townsite Drainage Improvements

A pre-proposal meeting is scheduled for Tuesday, November 13, 2018 at 10:00 am at Edinburg City Hall Community Room, 1st Floor. If you have any questions or require additional information regarding this RFP, please contact Ms. Lorena Fuentes, Purchasing Agent, at (956) 388-1895 or at the following e-mail address: lfuentes@cityofedinburg.com. **If you have any questions or require additional information regarding specifications for this proposal, please contact Mr. Isael Posadas, P.E., SDI Engineering, LLC, Office -(956) 287-1818.**

<u>Hand Delivered RFP'S:</u>	415 W. University Drive C/o City Secretary Department (1 st Floor)
<u>If using Land Courier (i.e.FedEx, UPS):</u>	City of Edinburg C/o City Secretary 415 W. University Drive Edinburg, Texas 78541
If Mailing Proposals:	City of Edinburg C/o City Secretary P.O. Box 1079 Edinburg, Texas 78540-1079

The City of Edinburg reserves the right to refuse and reject any or all RFP's and to waive any or all formalities or technicalities and to accept the RFP deemed most advantageous to the City, and hold the RFP's for a period of **90** days without taking action.

RFP's must be submitted in an envelope sealed with tape and prominently marked on the lower left hand corner of the envelope with corresponding RFP number and title.

Please read your requirements thoroughly and be sure that the RFP offered complies with all requirements/specifications noted. Any variation from the solicitation requirements/specifications must be clearly indicated by letter, on a point by point basis, attached to and made a part of your RFP. If no

exceptions are noted, and you are the successful respondent, it will be required that the service(s) be provided as specified.

PURPOSE

(1) The purpose of these solicitation documents is to provide a proposal for drainage improvements consisting of drainage pipe, inlets and manholes installation for:

South East Original Townsite Drainage Improvements

INTENT

(2) The services to be provided under this RFP shall be in accordance with and shall meet all specifications and/or requirements as shown in this solicitation for RFP. There is no intention to disqualify any respondent who can meet the requirements.

SUBMITTAL OF RFP

(3) RFPs shall be submitted in sealed envelopes as referenced on the attached solicitation. Three (3) complete sets of the response, one (1) original marked "**ORIGINAL**," and two (2) copies marked "**COPY**". RFPs submitted by facsimile (fax) or electronically shall **NOT** be accepted. Submittal of an RFP in response to this solicitation constitutes an offer by the respondent. Once submitted, RFP's become the property of the City of Edinburg and as such the City reserves the right to use any ideas contained in any RFP regardless of whether that respondent/firm is selected. Submission of a RFP in response to this solicitation, by any respondent, shall indicate that the respondent(s) has/have accepted the conditions contained in the RFP, unless clearly and specifically noted in the RFP submitted and confirmed in the contract between the City and the successful respondent otherwise. RFPs which do not comply with these requirements may be rejected at the option of the City. RFPs must be filed with the City of Edinburg before the deadline day and hour. No late RFPs will be accepted. They will be returned to respondent unopened (if properly identified). Failure to meet RFP requirements may be grounds for disqualification.

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Edinburg, Texas 78541

If Mailing RFP's: City of Edinburg
c/o City Secretary
P.O. Box 1079
Edinburg, Texas 78540-1079

RFP DOCUMENTS: Copies of the RFP Documents, including Drawings, Contract Documents and Technical Specifications may be obtained at SDI Engineering, LLC at 5602 E Iowa Rd, Edinburg, Texas 78542 office for **\$100.00 non-refundable** deposit payable to SDI Engineering, LLC.

TIME ALLOWED FOR ACTION TAKEN

(4) The City of Edinburg may hold RFP/s 90 days after deadline without taking action. Respondents are required to hold their RFP/s firm for same period of time.

RIGHT TO REJECT/AWARD

(5) The City of Edinburg reserves the right to reject any or all RFPs, to waive any or all formalities or technicalities, and to make such awards of contract as may be deemed to be the best and most advantageous to the City of Edinburg.

ASSIGNMENT

(6) Respondents are advised that the City of Edinburg shall not allow the successful respondent to sell, assign, transfer, or convey any part of any contract resulting from this RFP in whole or in part, to a third party without the written approval of the City of Edinburg.

AWARD

(7) Respondents are advised that the City of Edinburg is soliciting RFPs and award shall be made to the respondent that in the opinion of the City of Edinburg is the best qualified.

NUMBER OF CONTRACTS

(8) THE CITY reserves the right to award one or no contract in response to this RFP.

STATUTORY REQUIREMENTS

(9) It shall be the responsibility of the successful respondent to comply with all applicable State & Federal laws, Executive Orders and Municipal Ordinances, and the Rules and Regulations of all authorities having jurisdiction over the work to be performed hereunder and such shall apply to the contract throughout, and that they will be deemed to be included in the contract as though written out in full in the contract documents.

ALTERATIONS/AMENDMENTS TO RFP

(10) RFP **CANNOT** be altered or amended after opening time. Alterations made before opening time must be initialed by respondent guaranteeing authenticity. No RFP may be withdrawn after opening time without acceptable reason in writing and only after approval by the City of Edinburg.

NO RESPONSE TO RFP

(11) If unable to submit a RFP, respondent should return inquiry giving reasons.

LIST OF EXCEPTIONS

(12) The respondent shall attach to his/her RFP a list of any exceptions to the specifications/ requirements.

PAYMENT

(13) The City of Edinburg will execute payment by mail in accordance with the State of Texas Pay Law after SERVICES have been completed, introduced to the City, and found to meet City of Edinburg specifications/requirements. No other method of payment will be considered.

SYNONYM

(14) Where in this solicitation package SERVICES is used, its meaning shall refer to the request for the South East Original Drainage Improvements as specified.

RESPONDENT'S EMPLOYEES

(15) Neither the Respondent nor his/her employees engaged in fulfilling the terms and conditions of this Service Contract shall be considered employees of the City. The method and manner of performance of such undertakings shall be under the exclusive control of the vendor on contract. The City shall have the right of inspection of said undertakings at any time.

INDEMNIFICATION CLAUSE

(16) The Respondent agrees to indemnify and save harmless the City, from all suits and actions of every nature and description brought against them or any of them, for or on account of the use of patented appliances, products or processes, and he shall pay all royalties and charges which are legal and equitable. Evidence of such payment or satisfaction shall be submitted upon request of the Purchasing Agent, as a necessary requirement in connection with the final estimate for payment in which such patented appliance, products or processes are used

INTERPRETATIONS

(17) Any questions concerning the project and/or specifications/requirements with regards to this solicitation for statement(s) of qualifications shall be directed to the designated individuals as outlined in the RFP. Such interpretations, which may affect the eventual outcome of this request for statements of qualifications, shall be furnished in writing to all prospective Respondents via Addendum. No interpretation shall be considered binding unless provided in writing by the City of Edinburg in accordance with paragraph entitled "**Addenda and Modifications**".

VERBAL THREATS AND OFFICIAL CONTACT

(18) Any threats made to any employee of the City, be it verbal or written, to discontinue the providing of item/material/services for whatever reason and/or reasons shall be considered a breach of contract and the City will immediately sever the contract with the Respondent/Consultant on contract.

Respondents shall not offer gratuities, favors or any monetary value to any official or employee of the City for purpose of influencing the selection. Any attempt by any Respondent to influence the selection process by any means, other than disclosure of qualifications and credentials through the proper channels, shall be grounds from exclusion from the selection process. Once the project is advertised, there shall be no contact with any city official or employee unless using the formal process through the Purchasing Department. Failure to comply will result in the firm being disqualified from the process.

Questions and answers that change or substantially clarify the Request for Proposals will be affirmed in writing and copies will be provided to all firms on record responding to RFP. Any inquiries to this RFP must be submitted Ms. Lorena Fuentes, Purchasing Agent, at (956) 388-1895 or at the following e-mail address: lfuentes@cityofedinburg.com no later than **November 14, 2018 by 5:00 pm**.

CONFIDENTIAL INFORMATION

(19) Any information deemed to be confidential by the respondent should be clearly noted on the pages where confidential information is contained; however, the City cannot guarantee that it will not be compelled to disclose all or part of any public record under Texas Public Information Act, since information deemed to be confidential by the respondent may not be considered confidential under Texas Law, or pursuant to a Court order.

PAST PERFORMANCE

(20) Respondent's past performance shall be taken into consideration in the evaluation of RFP submittal.

JURISDICTION

(21) Contract(s) executed as part of this solicitation shall be subject to and governed under the laws of the State of Texas. Any and all obligations and payments are due and performable and payable in Hidalgo County, Texas.

RIGHT TO AUDIT

(22) The City of Edinburg reserves the right to audit the vendor's books and records relating to the performance of this contract. The City of Edinburg, at its own expense, shall have the right at all reasonable times during normal business hours and upon at least twenty-four (24) hours' advance notice, to audit, to examine, and to make copies of or extracts from the books of account and records maintained by the vendor(s) with respect to the Supply/Service and/or Purchase Contract. If such audit shall disclose overpayment by City to vendor, written notice of such overpayment shall be provided to the vendor and the amount of overpayment shall be promptly reimbursed by vendor to the City. In the event any such overpayment is not paid within ten (10) business days after receipt of such notice, the unpaid amount of such overpayment shall bear interest at the rate of one percent (1%) per month from the date of such notice until paid.

VENUE

(23) The parties agree that venue for purposes of any and all lawsuits, cause of action, arbitration, and/or any other dispute(s) shall be in Hidalgo County, Texas.

IF YOU HAVE ANY QUESTIONS ABOUT COMPLIANCE, PLEASE CONSULT YOUR OWN LEGAL COUNSEL. COMPLIANCE IS THE INDIVIDUAL RESPONSIBILITY OF EACH PERSON OR AGENT OF A PERSON WHO IS SUBJECT TO THE FILING REQUIREMENT. AN OFFENSE UNDER CHAPTER 176 IS A CLASS "C" MISDEMEANOR.

CONFLICT OF INTEREST

(24) CHAPTER 176 OF THE TEXAS LOCAL GOVERNMENT CODE

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. By law, this questionnaire must be filed with the records administrator of the City of Edinburg not later than the 7th business day after the date the person becomes aware of facts that require the statement be filed. See Section 176.006, Local Government Code. A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor. For more information or to obtain Questionnaire CIQ go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

CERTIFICATE OF INTERESTED PARTIES (Form 1295)

(25) In 2015, the Texas Legislature adopted [House Bill 1295](#), which added section 2252.908 of the Government Code. The law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency. The law applies only to a contract of a governmental entity or state

agency that either (1) requires an action or vote by the governing body of the entity or agency before the contract may be signed or (2) has a value of at least \$1 million. The disclosure requirement applies to a contract entered into on or after January 1, 2016. For more information go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

CONFIDENTIALITY OF INFORMATION AND SECURITY

(26) Should the successful respondent become the holder of and have access to confidential information in the process of fulfilling its responsibilities in connection with an awarded contract the successful respondent agrees that it shall keep such information confidential and will comply fully with the laws and regulations of the State of Texas, ordinances and regulations of the City, and any applicable federal laws and regulations relating to confidentiality.

TERMINATION OF CONTRACT

(27) The City of Edinburg reserves the right to terminate the contract if, in the opinion of the City of Edinburg, the successful vendor's performance is not acceptable, no funds are available, or if the City wishes, without cause, to discontinue this contract. Termination will be in written form allowing a 30-day notice.

RESPONSE DEADLINE

(28) Responses to the RFP must be addressed to City Secretary, City of Edinburg, 415 W. University Drive by **Monday, November 19, 2018 until 3:00 p.m.** for consideration. **An (1) original and two (2) copies** of complete sets of the response must be submitted no later than this date and time in a **sealed envelope** indicating that its contents are in response to the RFP for the **"South East Original Townsite Drainage Improvements"**. **Respondents are advised that all confidential records must be submitted in a separate sealed envelope and marked accordingly.**

Hand Delivered RFP's:

415 W. University Drive
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Edinburg, Texas 78541

If Mailing RFPs:

City of Edinburg
c/o City Secretary
P.O. Box 1079
Edinburg, Texas 78540-1079

ADDENDA AND MODIFICATIONS

(29) Any changes, additions, or clarifications to the RFP are made by amendments (addenda). Any respondent in doubt as to the true meaning of any part of the RFP or other documents may request an interpretation from the Purchasing Division. At the request of the respondent, or in the event the Purchasing Division deems the interpretation to be substantive, the interpretation will be made by written addendum. Said Addenda shall be mailed, e-mailed, hand delivered and/or faxed, to all prospective respondents. All Addenda issued in respect to this RFP shall be considered official changes to the original documents.

Verbal statements in response to inquiries and/or requests for explanations shall not be authoritative or binding. It shall be the respondent's responsibility to ensure that they have received all Addenda in respect to this project. Furthermore, respondents are advised that they must recognize, comply with, and attach a signed copy of each Addendum which shall be made part of their RFP Submittal. Respondent(s) signature on Addenda shall be interpreted as the respondent's "recognition and compliance to" official changes as outlined by the City of Edinburg and as such are made part of the original solicitation documents. Failure of any respondent to receive any such addendum or interpretation shall not relieve such respondent from its terms and requirements. The City may issue a written addendum no later than five calendar days prior to the date bids must be received. Addendums are available online at www.cityofedinburg.com.

RFP PREPARATION COSTS

(30) The City of Edinburg shall not be held liable for any costs incurred by any respondent for work performed in the preparation of and production of a RFP or for any work performed prior to execution of contract.

EQUAL EMPLOYMENT OPPORTUNITY

(31) Respondent agrees that they will not discriminate in hiring, promotion, treatment, or other terms and conditions of employment based on race, sex, national origin, age, disability, or in any way violate Title VII of 1964 Civil Rights Act and amendments, except as permitted by said laws.

AUTHORIZATION TO BIND RESPONDENT TO RFP

(32) RFPs MUST give full firm name and address of respondent, and be manually signed. Failure to do so will disqualify your RFP. Person signing bid must show title or AUTHORITY TO BIND HIS/HER FIRM IN A CONTRACT. Firm name and authorized signature must appear on each page that calls for this information. The legal status of the Respondent whether corporation, partnership, or individual, shall also be stated in the RFP. A corporation shall execute the RFP by its duly authorized officers in accordance with its corporate by-laws and shall also list the state in which it is incorporated. A partnership Respondent shall give full names and addresses of all partners. All partners shall execute the RFP. Partnership and Individual Respondent shall state in the proposal the names and addresses of all persons with a vested interest therein. The place of residence of each Respondent, or the office address in the case of a firm or company, with county and state and telephone number, shall be given after the signature.

BRAND OR MANUFACTURER REFERENCE

(33) Unless otherwise specified, any catalog or manufacturer's reference or brand name used in describing an item is merely descriptive, and not restrictive, and is used only to indicate type and style of product desired. Proposals on alternate brands will be considered if they meet specification requirements. If a bidder quotes on equipment other than the one(s) specified in the bid, sufficient specifications and descriptive (pictured literature) data must accompany same to permit thorough evaluation. In the absence of these qualifications, he/she will be expected to furnish the product called for.

COOPERATIVE PRICING

(34) Bidders are advised that in addition to responding to our "local" solicitation for bids/Bids with Dealer pricing, vendors/contractors are encouraged to provide pricing on the below referenced items/products/services based on BuyBoard, TX-MAS, H-GAC and/or any other State of Texas recognized and approved cooperative which has complied with the bidding requirements for the State of Texas. If bidding other than or in addition to "dealer" pricing, kindly duplicate the bid forms for each bid being provided from a cooperative contract. Any and all applicable fees must be included. All cooperative pricing

must be submitted on or before bid opening date and hour.

HB 89

(35) The 85th Texas Legislature approved new legislation, effective Sept. 1, 2017, which amends Texas Local Government Code Section 1. Subtitle F, Title 10, Government Code by adding Chapter 2270 which states that a governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it:

- 1) does not boycott Israel; and
- 2) will not boycott Israel during the term of the contract

Confidential Information Respondents are advised that all confidential records must be submitted in a separate sealed envelope and marked accordingly.

SECTION I SCOPE OF THE PROPOSAL

INTRODUCTION

The purpose of the RFP is to solicit and obtain from interested parties (also referred to herein as “Vendor” or “Vendors”) the best possible proposal for the South East Original Townsite Drainage Improvements. The City of Edinburg intends to select the most competitive proposal that meets the City’s requirements and specifications listed within the proposal and then enter into negotiations with the Vendor/s for purposes of reaching a satisfactory agreement for the City for the South East Original Townsite Drainage Improvements.

BACKGROUND

The City of Edinburg South East Original Townsite Drainage Improvements project will mitigate drainage issues occurring within the project area.

SCOPE OF WORK

The City is soliciting competitive proposals from experienced and qualified companies for the South East Original Townsite Drainage Improvements. The project will improve the drainage in the area.

ADDITIONAL INFORMATION

The City of Edinburg is requesting that RFP’s (Request for Proposal) be routed to: The CITY Secretary, at 415 West University, Edinburg, Texas 78541.

NON-COLLUSION

Submitters, by submitting a signed submission, certify that the accompanying submission is not the result of, or affected by, any unlawful act of collusion with any other person or company engaged in the same line of business or commerce, or any other fraudulent act punishable under Texas or United States law.

NON-DISCRIMINATION

Submitters, during the performance of this contract, will not discriminate against any employee or applicant for employment because of race, religion, sex, national origin or disability except where religion, sex, national origin or disability is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor.

PROCESSING TIME FOR PAYMENT

Submitters are advised that a minimum of thirty (30) days is required to process invoices for payment.

ELECTRONIC SUBMISSION OF BIDS

The City of Edinburg’s City Secretary Department will not accept telegraphic or electronically transmitted submissions.

PROOF OF FINANCIAL AND BUSINESS CAPABILITY

Submitters must, upon request, furnish satisfactory evidence of their ability to furnish products or services in accordance with the terms and conditions of these requirements. The CITY will make the final determination as to the submitter’s ability.

SUBMITTER DEFAULT

The City of Edinburg reserves the right, in case of submitter default, to procure the articles or services from other sources and hold the defaulting submitter responsible for any excess costs occasioned thereby.

RESTRICTIVE OR AMBIGUOUS REQUIREMENTS

It is the responsibility of the submitter to review the Request for Proposals (RFP) packet and to notify the City Engineering Department if the requirements are formulated in a manner that would unnecessarily restrict competition. Any such protest or question regarding the requirements or bidding procedures must be received in the City Secretary Department not less than seventy-two hours prior to the time set for the opening. These criteria also apply to requirements that are ambiguous.

RFP DELIVERY

The City of Edinburg requires submitters, when hand-delivering proposals by **3:00 pm on November 19, 2018**, to have a City Secretary Department representative time/date stamp and initial the envelope.

SIGNING OF PROPOSALS

In order to be considered, all submittals **must** be signed.

WAIVING OF INFORMALITIES

THE CITY reserves the right to waive minor informalities or technicalities when it is in the best interest of THE CITY.

SUBCONTRACTING

The successful submitter may not subcontract the award without the written consent of the City.

BIDDER RESPONSIBILITY

It is the responsibility of each vendor before submitting a proposal:

- To examine thoroughly the contract documents and other related data identified in the proposal documents.
- To visit the site to become familiar with and satisfy vendor as to the general, local, and site conditions that may affect cost, progress, performance, etc.
- To consider federal, state, and local laws and regulations that may affect costs, progress, performance or furnishing of the work.
- To study and carefully correlate vendor's knowledge and observations with the contract documents and such other related data.
- To promptly notify THE CITY Purchasing of all conflicts, errors, ambiguities, or discrepancies which vendor has discovered in or between the contract documents and such other related documents.

TERMINATION

THE CITY has the authority and express right to terminate any Agreement awarded under this RFP or any Work Order resulting from the Agreement at any time for any reason, including but not limited to,

instances where THE CITY finds that the Contractor's work is negligent, not satisfactory, or not in accordance with the Agreement requirements.

SECTION II RFP REQUIREMENTS

PURPOSE

The intent of this Request for Proposal and resulting contract is to obtain proposals for the South East Original Townsite Drainage Improvements.

REQUEST FOR PROPOSALS

The required contents and limitations for the preparation of the RFP are described in this section. Failure to provide the requested information or adhere to any of The CITY limitations will result in disqualification of the submitted RFP. A total of **one (1) original and two (2) copies** of the RFP shall be submitted to the address on the cover letter. Letter of Intent from Surety Company to provide Payment and Performance Bonds shall also be required from the proposer as part of RFP.

SUBMITTAL

For proper comparison and evaluation, THE CITY requests that proposals address, at a minimum, the following format.

- 1) **Cover Letter** - A brief introductory letter of representation.
- 2) **Executive Summary** - A brief summary highlighting the most important points of the proposal. If used, the Summary should not exceed five pages.
- 3) **Degree of Compliance** - A statement that all products and services quoted in proposal is in full accord with the specifications or a brief listing of all those specification sections to which the Proposer takes exception. All explanations, exceptions, comments, etc., pertaining to the specific sections of the specifications shall be listed and numbered in order of the respective article of the specification.

CONTENTS

The required contents for the RFP are presented below in the order they should be incorporated into the submitted document.

- 1) **UNDERSTANDING OF THE PROJECT:** This section should demonstrate the submitter's understanding of the project's needs, the work required, and any local issues or concerns. This description should be concise, candid, and limited to 2 pages in length.
- 2) **FIRM QUALIFICATIONS, PERSONNEL AND STAFFING:** The CITY is seeking a contract with a competent firm(s); with a minimum of 5 years' experience of the construction of drainage improvements.
 - a) **Qualifications:**
 - i) List Firm's qualifications and ability to perform the service requirements.

- ii) List qualifications of key personnel to be assigned to this project, including but not limited to education, training, registrations, certifications and licenses.

b) Experience:

- i) Number of years of experience as a General Contractor.
- ii) Relevant experience with projects of similar size and scope performed over the past five (5) years. For each project listed, date services provided and name, titles, and telephone numbers of each client or client's representative.
- iii) Specific experience with public entity clients, especially large municipalities. If company submitting proposal for new construction has provided services to the CITY in the past, identify the name of the project and the department for which services were provided.
- iv) If company submitting proposal for this project is submitting as a team or joint venture, provide the same information for each member of the team or joint venture.
- v) Provide the following information for key personnel to be assigned to this project:
 - (1) Total years' experience.
 - (2) Primary work assignment for the projects outlined in this RFP.
 - (3) Relevant experience with projects of similar size and scope.

c) Previous Project Performance:

- i) Provide evidence of satisfactory performance on past projects
- ii) List past assignments over the past five (5) years
- iii) Provide copies of outstanding service letters, letters of commendation, service awards, etc.
- iv) Provide five recent references who may be contacted to verify performance of similar services. For each reference, provide a current phone number and e-mail address. References may not be present or former CITY employees.

d) Quality of Service:

- i) Company submitting proposal for the South East Original Townsite Drainage Improvements – Availability: Identify any concurrent or near future commitment that would impede the firm's ability to perform this contract.
- ii) Describe company submitting proposal for the South East Original Townsite Drainage Improvements policies, procedures and plans to ensure quality services (continuing education, on-going training, internal quality practices, etc.)
- iii) If company submitting proposal for the South East Original Townsite Drainage Improvements has ever had a contract terminated or has been dismissed due to alleged unsatisfactory performance, state when, where and why the contract was terminated and/or Security Consultant dismissed, the client's name, and the contact person's phone number.

- 3) **Proposal Pricing/Delivery** - Pricing shall be inclusive for all items requested in this proposal. Brief notes referencing specific line items may be included, if necessary, for explanation. Proposal

shall state all labor, materials and equipment necessary to complete the project as stated in the SCOPE OF WORK (Page 2).

- 4) **Contractor Background Information** - This section should include a description of the Proposer experience with other services similar to the one described herein. This information should include scope of several similar jobs including magnitude and cost, customer contacts and other information that THE CITY can use as a basis for performance evaluation. This section should also include information on your organization and staff assigned to the project.
- 5) **References** - Proposer shall submit with this proposal a list of at least three (3) references where like services or similar projects have been performed by their firm. Include name of firm, address, telephone number and name of representative.
- 6) **Schedule** – Proposer shall submit the amount of working days that will take company to complete project.

**SECTION III
SELECTION AND SCHEDULES**

SELECTION PROCEDURES

The RFP shall be submitted according to the schedule below.

PROPOSAL RANKING

A selection committee will evaluate and rank the written RFPs on a per project basis. After the RFPs have been ranked, the committee will make a recommendation to the CITY Council.

RFP SUBMITTED TO

An original and two (2) copies of RFPs should be submitted to:

**City of Edinburg
c/o City Secretary
415 West University
P.O. Box 1079
Edinburg, Texas 78541**

RFPs must be submitted by **no later than 3:00 p.m. on Monday, November 19, 2018.**

**SECTION IV
FIRM and RFP EVALUATION**

RFP – EVALUATION

The evaluation system consists of a 100 Point system. The RFP will be ranked after evaluation. All RFP's submitted will be ranked and evaluated based on specified RFP criteria. The submittal evaluation will be based on the following criteria.

- **40 Points: Proposer's itemized and total proposed price**
 - Total estimated cost for base bid submitted*

*Alternates might be included based on what is most advantageous to City.
- **40 Points: Proposer's qualifications/experience and performance/references**
 - Demonstrated prior experience for similar projects (20 points)
 - Number of years in business (5 points)
 - Litigation History/Lawsuit History (5 points)
 - References (10 points)
- **10 Points: The Proposer's Team and Subcontractors.**
 - Resumes for Key Individuals (5 points)
 - Project Superintendent
 - Project Manager
 - List of Subcontractors (5 points)
- **10 Points: Schedule.**
 - Lowest total days (10 points)
 - Within 30 days of lowest (8 points)
 - Within 60 days of lowest (6 points)
 - More than 60 days from lowest (5 points)

Proposed Price (40 points):

The price will be evaluated and scored based on the main proposal cost. The City reserves the right to include any and all alternate price proposals in the price evaluation process. The established budget will determine which, if any, alternates will be recommended and accepted as part of the overall price ranking evaluation. After the highest ranked firm is selected, negotiations on price and changes on the scope of work may occur with the firm that provides the best value to the City.

Points will be awarded based upon the total number of offers submitted. The lowest offeror will receive the maximum number of points and the highest offeror will receive the minimum number of points. A point spread system will be established once all the offers are tabulated. The closer the prices of the offers, the larger the point spread will be.

SAMPLE: Utilizing the 80% Spread Formula

Contractor	Price	Points
Offeror No. 01	\$1,000,000.00	40.0

Offeror No. 02	\$1,050,000.00	37.33
Offeror No. 03	\$1,100,000.00	34.67
Offeror No. 04	\$1,150,000.00	32.0

70% spread: 40 x 70% = 28.0 points	Results: 12 points spread
75% spread: 40 x 75% = 30.0 points	Results: 10 points spread
80% spread: 40 x 80% = 32.0 points	Results: 8 points spread
85% spread: 40 x 85% = 34.0 points	Results: 6 points spread
90% spread: 40 x 90% = 36.0 points	Results: 4 points spread
95% spread: 40 x 95% = 38.0 points	Results: 2 points spread

If the committee decided to utilize the 90% spread formula, Offeror No. 04 is only 4 points away from Offeror No. 1. The committee may feel that a 4 point difference is too close, and is unfair to the lowest price offeror. A 70% spread, or 12 point difference, may be too far spread out and may be considered unfair to the highest price offer. Especially since the prices are not too far apart on a \$1 Million project. The point spread could be very different on a \$300,000.00 project budget versus a \$30 million project budget.

After the percentage spread is agreed upon, in this case the 80% formula, the lowest offeror gets the maximum 40 points and the highest offeror gets 32 points. Everyone else in the middle will get their points scored proportionately (extrapolated). This is the scoring system which will be utilized by the ranking committee on the price category for all construction projects. The point system will vary from project to project depending on the project budget ranges, on the number of offers submitted, and on the price spread differences between all offerors.

RESPONDENT – EVALUATION

The evaluation system consists of a 100-point system. The firms will be ranked after evaluation. Categories under the 100-point system include response to RFP. RFP submittal evaluation will be based on the following criteria.

STAFFING OF PROJECT TEAM

The firms should provide information on their proposed professional team members, i.e., applicable certifications/registrations and other pertinent information that demonstrates their qualifications to perform the contract. The professional team members shall have experience in performing similar contracts for counties, cities, irrigation districts, TX DOT or other clients as stated in the Request for Proposals (RFP). Similar experience gained through other clients should be substantiated by reference. A list and scope of the various projects for comparative purposes shall be included in an appendix.

EXPERIENCE OF PROJECT TEAM/ABILITY TO COMMIT RESOURCES

The provider shall designate experienced staff to completely and efficiently perform the work. Also, in this section, outline the firm’s contingency plans for servicing the project in the event that one or more key personnel are not available for any reason during the period of performance.

METHODOLOGY

The RFP should provide a description of the firm’s approach to the methodology and management to the scope of services for the project.

UNDERSTANDING OF PROJECT/SIMILAR PROJECTS

The proposal shall include the following:

1. Address appropriate Federal/State/Local regulations and policies
2. Identify information to be gathered or obtained

The respondents should provide as much background information as to its experience in providing similar services to State, CITY, County or any other governmental agencies. Reference information should be as current as possible, especially contact persons and telephone numbers.

FAMILIARITY WITH APPLICABLE RULES AND REGULATIONS

The RFP should indicate, through past experience of the proposed Team, that they possess sufficient knowledge of governmental regulations, appropriate codes, guidelines, professional standards and policies (as required).

SECTION V
AWARD OF CONTRACT, RESERVATION OF RIGHTS

Number of Contracts

The CITY reserves the right to award one or no contract(s) in response to this RFP.

Advantageous Contract

The Contract/s, if awarded, will be awarded to the vendor/s submitting proposal for the South East Original Townsite Drainage Improvements whose Submittal(s) is/are deemed most advantageous to the CITY and, as determined by the selection committee, upon approval of the CITY Council.

Final Selection and City Council Approval

The CITY may accept any Submittal in whole or in part. If subsequent negotiations are conducted, they shall not constitute a rejection or alternate RFP on the part of THE CITY. However, final selection of a company submitting proposal for the South East Original Townsite Drainage Improvements is subject to City Council approval.

Remedy of Technical Errors

The CITY reserves the right to accept one or more submittals or reject any or all submittals received in response to this RFP, and to waive informalities and irregularities in the submittals received. The CITY also reserves the right to terminate this RFP, and reissue a subsequent solicitation, and/or remedy technical errors in the RFP process.

Preparation Costs

This RFP does not commit the CITY to enter into a Contract, award any services related to this RFP, nor does it obligate the CITY to pay any costs incurred in preparation or submission of a submittal or in anticipation of a contract.

Insurance and Indemnity

If selected, vendor/s submitting proposal for the South East Original Townsite Drainage Improvements will be required to comply with the Insurance and Indemnity Requirements established herein.

Independent Contractor

The company/s submitting proposal for the South East Original Townsite Drainage Improvements agrees and understands that, if selected, it and all persons designated by it to provide services in connection with a contract, is (are) and shall be deemed to be (an) independent contractor(s), responsible for its (their) respective acts or omissions, and that THE CITY shall in no way be responsible for company submitting proposal for the South East Original Townsite Drainage Improvements actions, and that none of the parties hereto will have authority to bind the other or to hold out to third parties.

Purchase Orders, As Needed

Execution of a contract does not obligate the CITY to engage any delivery orders, Purchase Orders, or other commitments for services. Service delivery shall be at the CITY's discretion, as needed, and will be communicated to the company submitting proposal for the South East Original Townsite Drainage Improvements through individual Purchase Orders.

ATTACHMENT I Insurance Requirements

The Respondent awarded the contract shall furnish proof of insurance, which will also include any subcontractor that is subcontracted by the bidder in at least the following limits, to be in place prior to providing any services under this Contract and to continue in effect at all times during the term of this Contract:

- 1 Professional liability insurance policy with limits of at least One Million Dollars (\$1,000,000) per occurrence, or limited to claims made, include at least a five (5) year extended reporting period.

- 1 Automobile liability insurance policy with limits of at least Three Hundred Thousand Dollars (\$300,000) per person and \$500,000 per occurrence consistent with potential exposure to The CITY under the Texas Tort Claims Act. Coverage should include injury to or death of persons and property damage claims (with limits up to \$500,000) arising out of the services provided to The CITY hereunder.

- 1 Uninsured/Underinsured motorist coverage in an amount equal to the bodily injury limits set forth immediately above;

- 1 A Five Hundred Thousand Dollar (\$500,000) Comprehensive General Liability insurance policy providing additional coverage to all underlying liabilities of The CITY consistent with potential exposure of The CITY under the Texas Tort Claims Act;

- 1 Workers' compensation insurance in amounts established by Texas law, unless the Bidder is specifically exempted from the Texas Workers' Compensation Act, Texas Labor Code Chapter 401, et. Seq.

Certificates of insurance naming The CITY as an additional insured shall be submitted to The CITY for approval prior to any services being performed by Contractor. Each policy of insurance required hereunder shall extend for a period equivalent to, or longer than the term of the Contract, and any insurer hereunder shall be required to give at least thirty (30) days written notice to The CITY prior to the cancellation of any such coverage on the termination date, or otherwise. This Contract shall be automatically suspended upon the cancellation, or other termination, of any required policy of insurance hereunder, and such suspension shall continue until evidence that adequate replacement coverage is provided to The CITY. If replacement coverage is not provided within thirty (30) days following suspension of the Contract, the Contract shall automatically terminate.

ATTACHMENT II
Insurance Requirement Acknowledgement

I, _____, authorized representative for _____,
Company/Vendor

Hereby acknowledge the receipt of The CITY's required insurance limits. Said requirements:

- Will be acquired within 10 working days after notification from the Department of Public Works of proposal awarded by The CITY of Edinburg; (*An insurance certificate for the required insurance limits shall be provided to the Director of Public Works in order to qualify for award of bid and to execute a contract between the Company and The CITY.)
- Will acquire additional amount needed to meet The CITY's requirements within 10 working days after notification from the Department of Public Works of bid awarded by The CITY of Edinburg; currently carry the following:

Professional Liability (Errors & Omissions): \$ _____

Automobile Liability: \$ _____ General Liability: \$ _____

(* An insurance certificate for the required insurance limits shall be provided to the Director of Public Works in order to qualify for award of bid and to execute a contract between the Company and The CITY.) **OR**

- Have already been met (see attached copy of insurance certificate).

Authorized Representative

Date

Notice to Bidder: Failure to provide Certificates of Insurance to the Director of Public Works will cause the bid award to be rescinded and then awarded to next lowest bidder. Certificates of Insurance will be monitored/verified on a **quarterly basis** to ensure that coverage policy is in place. It is the Company's obligation to maintain the appropriate insurance coverage throughout the term of the contract.

THIS FORM MUST ACCOMPANY BID PACKET
ATTACHMENT III

**Project Requirements
Acknowledgement**

This is to certify that I, _____, possess all of the **APPLICABLE:**

- 1. Licenses: _____
- 2. Bonds: _____
- 3. Certificates: _____
- 4. Permits: _____
- 5. Other: _____

necessary to carry out the required project. Furthermore, I am providing copies of the required documentation, so that if my company is awarded the bid, I may be eligible to enter a contract with the CITY and proceed to complete the project in a timely manner.

*** Any license, bonds, certificates, permits, etc. which are required must be presented as part of the bid packet in order to expedite the bid evaluation process. Failure to provide said documentation will result in the disqualification of your bid.**

_____	_____
Authorized Signature	Date

Company	

Address	

City, State, Zip	

ATTACHMENT V

**VENDOR/S PROVIDING PROPOSAL FOR THE
SOUTH EAST ORIGINAL TOWNSITE DRAINAGE IMPROVEMENTS
QUALIFICATIONS
GENERAL QUESTIONNAIRE**

- 1 Name/Name of Agency/Company: _____
(Full, correct legal name)
- 2 Address: _____

3. Telephone/Fax: _____
4. Does your Company anticipate any mergers, transfer of organization ownership, management reorganization, or departure of key personnel within the next twelve (12) months that may affect the organization's ability to carry out its submittal?

Yes____ No____
5. Is your Company authorized and/or licensed to do business in Texas?
Yes____ No____
6. Where is the Company's corporate headquarters located? _____
7. a. Does the Company have an office located in Edinburg, Texas?

Yes____ No____

b. If the answer to the previous question is "yes", how long has the Company conducted business from its Edinburg office?

_____ (years) _____ (months)

c. State the number of full-time employees at the Edinburg office. _____
8. a. If the Company does not have an Edinburg office, does the Company have an office located in Hidalgo County, Texas?

Yes____ No____

b. If the answer to the previous question is yes, how long has the Company conducted business from its Hidalgo County office?

_____ (years) _____ (months)

c. State the number of full-time employees at the Hidalgo County office. _____

9. Has the Company or any of its principals been debarred or suspended from contracting with any public entity? Yes____ No____

If yes, identify the public entity and the name and current phone number of a representative of the public entity familiar with the debarment or suspension, and state the reason for or circumstances surrounding the debarment or suspension, including but not limited to the period of time for such debarment or suspension. ____

10. Indicate person whom The CITY may contact concerning your submittal or setting dates for meetings.

Name: _____

Address: _____

Telephone: _____

Fax: _____

Email: _____

11. Surety Information

Have you or the Company ever had a bond or surety instrument "called," canceled, or forfeited?

Yes () No ().

If yes, state the name of the bonding company, date, amount of bond and reason for such bond being "called," or its cancellation or forfeiture. _____

12. Bankruptcy Information

Have you or the Company ever been declared bankrupt or filed for protection from creditors under state or federal proceedings? Yes () No ()

If yes, state the date, court, jurisdiction, cause number, amount of liabilities and amount of assets. _____

13. Provide any other names under which your business has operated within the last 10 years.

ATTACHMENT VI
HOUSE BILL 89 VERIFICATION

I, _____, the undersigned representative of _____, (Company or Business name) (hereafter referred to as company) **being an adult over the age of eighteen (18) years of age, verify that the company named-above, under the provisions of Subtitle F, Title 10, and Government Code Chapter 2270:**

- 1. Does not boycott Israel currently; and**
- 2. Will not boycott Israel during the term of the contract.**
- 3) Is not currently listed on the State of Texas Comptroller’s Companies that Boycott Israel List located at <https://comptroller.texas.gov/purchasing/publications/divestment.php>**

Pursuant to Section 2270.001, Texas Government Code:

1. “Boycott Israel” means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and

2. “Company” means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or any limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business associations that exist to make a profit.

SIGNATURE OF COMPANY REPRESENTATIVE:

TYPE/PRINT NAME AND TITLE:

DATE:

ATTACHMENT VII

SUBMITTAL CHECKLIST

This checklist is to help the company submitting proposal for the South East Original Townsite Drainage Improvements ensure that all required documents have been included in its submittal.

Document and Location in Submittal	Check or Initial to Indicate Document is Attached to Submittal
Tab A – Interest Statement	
Tab B – Company submitting proposal for the South East Original Townsite Drainage Improvements Qualification General Questionnaire (Attachment VI in RFP)	
Tab C – *Project Requirements Acknowledgement (Attachment V in RFP)	
Tab D – Litigation Disclosure (Attachment IV in RFP)	
Tab E – Proof of Insurability (Letter from Insurance Provider and copy of current Insurance Certificate)	
Tab F – *Insurance Requirement Acknowledgement (Attachment II in RFP)	
Tab G – Letter of Intent from Surety Company to provide Payment and Performance Bonds. (Section II in RFP Requirements)	
Tab H – Submittal Checklist (Attachment VI in RFP)	
Tab I - *House Bill 89 Verification (Attachment VI)	
Tab J- *Formal Proposal for the South East Original Drainage Improvements	
1 Original* and 2 Copies of Submittal	

***Documents marked with an asterisk on this checklist require a signature. Be sure they are signed prior to submittal.**

REQUEST FOR COMPETITIVE SEALED PROPOSAL FORM
RFP NO. 2019-08 South East Original Townsite Drainage Improvements
EDINBURG, TEXAS

MR. JUAN G. GUERRA
CITY MANAGER
CITY OF EDINBURG
415 W. UNIVERSITY DRIVE
EDINBURG, TEXAS 78539

The undersigned, as bidder(s), declares that the only person or parties interested in this proposal as principals are those named herein, that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the Form of Contract, Notice to Bidders, General Conditions, Special Provisions, Measurement and Basis of Payment, specifications and the plans thereon referred to, and has carefully examined the locations, and conditions and classes of materials of the proposed work; and agrees that he will provide all the necessary labor, machinery, tools, and apparatus, and other items incidental to construction, and will do all the work and furnish all the materials called for in the contract and specifications in the manner prescribed therein and according to the requirements of the Engineer as therein set forth.

It is understood that the following quantities of work to be done at unit prices are approximate only and are intended principally to serve as a guide in evaluating bids.

It is further agreed that the quantities of work to be done at unit price and materials to be furnished, may be increased or diminished as may be considered necessary, in the opinion of the Engineer, to complete the work fully as planned and contemplated, and that all quantities of the work, whether increased or decreased, are to be performed at the unit prices set forth below except as provided for in the specifications.

It is further agreed that lump sum prices may be increased to cover additional work ordered by the Engineer, but not shown on the plans or required by the specifications, in accordance with the provisions of the General Conditions. Similarly, they may be decreased to cover deletion of work so ordered.

The 5% bid security accompanying this proposal shall be returned to the bidder, unless in case of the acceptance of the proposal the bidder shall fail to execute a contract and file a performance bond and payment bond within the ten (10) days after its acceptance, in which case the bid security shall become the property of the OWNER, and shall be considered as payment for damages due to delay and other inconveniences suffered by the Owner on account of such failure of the bidder. It is understood that the Owner reserves the right to reject any or all bids.

ORIGINAL BID PROPOSAL FORM MUST BE SUBMITTED ALONG WITH THE BID AND CONTRACT DOCUMENTS BOOKLET

BIDDERS BOND in the amount of \$_____, (5%) of the greatest amount bid in compliance with the INSTRUCTION TO BIDDERS.

The above Cashiers Check or Bidder's Bond is to become the property of the OWNER, in the event the construction contract (when offered by the Owner) and bonds are not executed within the time set forth.

IMPORTANT NOTES:
For information regarding the method UNIT ITEMS are to be MEASURED AND PAID, please refer to the "MEASUREMENT AND BASIS OF PAYMENT" Section attached and made part of this Proposal.

A. BASE BID ESTIMATED QUANTITIES:

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
1.	1	LS	Preparation of Project Limits , including clearing, demolition and disposal of any roadway structures, removal of existing pipe and all appurtenances, all necessary additional fills and cuts, hauling and spreading of select material to the limits indicated on the plans, <u>utility location and coordination with all pertinent affected entities</u> , cleanup, site restoration and demobilization, all complete per Lump Sum (LS) for	\$_____	\$_____
2.	3,900	LF	36" RCP CLASS III PIPE , installed including joining of pipes, bedding, trench excavation, backfill, and compaction, <u>connections to new or existing structures</u> , installed as per plans and specifications, <u>maintenance of driveway access to homes along work route</u> , all complete in place per linear foot (LF) for	\$_____	\$_____
3.	550	LF	24" RCP CLASS III PIPE , installed including joining of pipes, bedding, trench excavation, backfill, and compaction, <u>connections to new or existing structures</u> , installed as per plans and specifications, <u>maintenance of driveway access to homes along work route</u> , all complete in place per linear foot (LF) for	\$_____	\$_____
4.	3,800	SY	Asphalt Pavement Repair , 2" HMAc, 8" Flexible Base, 6" subgrade, sawcut, compacted, in accordance with plans and specifications, all complete in place per square yard (SY) for	\$_____	\$_____

5.	1,100	LF	Reinforced Concrete Valley Gutters , including reinforcing steel, subgrade preparation, backfill and compaction, flexible base, expansion joint between curb and gutter, cast in place concrete, all complete per linear foot (LF) for	\$_____	\$_____
6.	3	EA	Concrete Storm Sewer Manholes , all depths, including material, backfill, compaction, installed as per plans and specifications, all complete per each (EA) for	\$_____	\$_____
7.	4	EA	Drainage Manhole Interconnection (Champion Street) , all depths, including material, backfill, compaction, including interconnection of 42" line, installed as per plans and specifications, all complete per each (EA) for	\$_____	\$_____
8.	36	EA	Type "F" Curb Inlets , installed as per plans and specifications, <u>including concrete curb repairs which are subsidiary to this bid item</u> , structure, grading, excavation, backfilling and compaction, curb removal and replacement, all complete in place per each (EA) for	\$_____	\$_____
9.	20	EA	Inlet Removal (as per Detail "A") , with asphalt and curb repair, cap drain line, all complete in place per each (EA) for	\$_____	\$_____
10.	1	LS	Dewatering System as Required , and all subsidiary items including but not limited to design, wellpoints, header pipes, pumping, furnishing, installing, operating, maintaining and removal of temporary dewatering system, as required to lower and control water levels during construction activities, with disposal of any water to the existing sanitary sewer system, all complete in place per lump sum (LS) for	\$_____	\$_____
11.	4,450	LF	Trench Safety System , as required, including shoring and/or step excavation system in accordance with OSHA guidelines, all complete in place per linear foot (LF) for	\$_____	\$_____
12.	1	LS	Traffic Control , for entire project including roadway crossings, signage, detours, temporary drive installation, permits, Traffic Control Plan prepared by a Registered Professional Engineer, all in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD, latest edition), all complete in place per lump sum (LS) for	\$_____	\$_____

13.	1	LS	Stormwater Pollution Prevention Plan (SWPPP) and Stormwater Permit as per City, State and Federal requirements, including required permits, inspections, and submittal of forms to governmental agencies (NOI, NOC's, NOT), all complete for the term of the project per lump sum (LS) for	\$ _____	\$ _____
14.	1	LS	Erosion Control Devices , as per the SWPPP for the entire Project, all complete in place including maintenance, replacement and removal after project completion per lump sum (LS) for	\$ _____	\$ _____
15.	1	LS	Contingency – To be used for any additional items required for the Project, <u>subject to the Owner's authorization and written approval of mutually agreed upon amounts prior to use</u> , per Lump Sum (LS) for		\$50,000.00

TOTAL BASE BID IMPROVEMENTS: (Item 1-15) \$ _____

C. ADD ALTERNATE NO. 1:

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
16.	4,700	LF	Cleaning and televising of Existing 72" Drain Line and Outfall Area (as shown on plans) , including complete cleaning and internal inspection and television monitoring, labor, equipment and related confined space safety equipment/procedures, bypass plumbing, drain dewatering, disposal of all removed material, and any associated work per Linear Foot (LF) for	\$ _____	\$ _____

TOTAL: ADD ALTERNATE NO. 1 (item16) \$ _____

C. ADD ALTERNATE NO. 2:

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
17.	1	LS	Waterline Conflict Repairs and Service Reconnections , (<u>Contractor to field verify conditions prior to bidding to determine scope of work</u>) including waterline conflicts which may include repairs to asbestos pipe with PVC, (as per City of Edinburg requirements) including fittings, couplings, and all other associated work per Lump Sum (LS) for	\$ _____	\$ _____

18.	1	LS	Sanitary Sewer Repairs/Adjustments (Contractor to field verify conditions prior to bidding to determine scope work) including locating and adjusting, replacement of concrete rings and covers (as per City of Edinburg requirements), risers, grade adjustment, and any other associated work per Lump Sum (LS) for	\$ _____	\$ _____
-----	---	----	--	----------	----------

TOTAL: ADD ALTERNATE NO. 2 (item17-18) \$ _____

TOTAL PROJECT PRICE: (items 1-18) \$ _____

The undersigned agrees, unless hereinafter stated otherwise to furnish all materials as shown and specified in the Plans and Specifications.

Bidder hereby agrees to commence work under this contract within 10 days after "NOTICE TO PROCEED" is issued, and to complete all the work in the Contract within **180 Calendar Days**. The undersigned bidder acknowledges the receipt of the following addenda:

ADDENDUM NO.	DATE	BY
ADDENDUM No. 1		
ADDENDUM No. 2		
ADDENDUM No. 3		
ADDENDUM No. 4		

DATE: _____

BY: _____
(Signature)

(Type or Print Name)

(Title)

(Company)

(Address)

(City, State, Zip)

(Phone Number)

(Fax Number)

(E-mail Address)

(Seal – If Bidder is a Corporation)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____ as Principal, and _____
_____ as Surety, are hereby held and
firmly bound unto _____ as Owner in the penal sum of ____
_____ for the
payment of which, well and truly to be made, we hereby jointly and severally bind
ourselves, successors and assigns.

Signed this _____ day of _____, 20_____.

The Condition of the above obligation is such that whereas the Principal has submitted
to _____ a certain BID, attached hereto
and hereby made a part hereof to enter into a contract in writing, for the _____

_____.

NOW, THEREFORE,

- (a) If said BID shall be rejected, or
- (b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of

the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

BY: _____

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

MEASUREMENT AND BASIS OF PAYMENT

1.00 GENERAL

IT IS THE INTENT OF THIS CONTRACT TO COVER ALL THE WORK TO BE PERFORMED SUBSIDIARY TO ALL THE ITEMS INCLUDED IN THE BID AND SUCH PRICES SHALL BE BALANCED INDIVIDUALLY AND SHALL INCLUDE FURNISHING ALL MATERIALS, SUPERINTENDENCY, SUPERVISION, CONSTRUCTION SURVEYING AND LAYOUT, LABOR, INSURANCE, BONDS, BENEFITS, MACHINERY, FUEL, VEHICLES, SAFETY EQUIPMENT, ADMINISTRATIVE COSTS, QUALITY CONTROL, GUARANTEES AND WARRANTIES, OVERHEAD, AND ALL INCIDENTALS FOR COMPLETING THE ASSIGNED WORK IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS COMPLETE IN PLACE. **IN CASE THE FOLLOWING MEASUREMENT AND BASIS OF PAYMENT DESCRIPTIONS CONFLICT WITH THE CORRESPONDING DESCRIPTIONS CONTAINED WITHIN THE TECHNICAL SPECIFICATIONS FOR THIS PROJECT, THE FOLLOWING DESCRIPTIONS SHALL GOVERN.**

THE FOLLOWING APPLICABLE ITEMS SHALL BE CONSIDERED AS PAY ITEMS. ALL OTHER WORK NOT SPECIFICALLY LISTED OR INDICATED BELOW SHALL BE SUBSIDIARY TO THE OVERALL COST OF THE PROJECT. ALL EXCAVATION IS UNCLASSIFIED.

1.02 STORM SEWER IMPROVEMENTS

1. **PREPARATION OF PROJECT LIMITS/DEMOLITION, MOBILIZATION AND DEMOBILIZATION:** When called for in the proposal shall be measured and paid for per LUMP SUM (LS) and shall include mobilization of equipment, clearing, grubbing, demolition, removal and disposal of existing pavement and any other structures within the project area, utility location and coordination with all pertinent affected entities, cleanup, site restoration and demobilization upon completion of project.
2. **REINFORCED CONCRETE PIPE (RCP):** When called for in the proposal, shall be measured and paid per LINEAL FOOT (L.F.) **for the constructed length, FOR THE DIAMETER, AND D-LOAD OR CLASS SPECIFIED** and as shown on the plans, **all depths**, and shall include removal of pipe, furnishing, hauling, placing and joining of pipes, cutting of skews or slopes, all connections to new or existing structures, unclassified excavation, moving and reusing appurtenances where required, for removing and disposing of portions of existing structures as required; and for all labor, tools, bedding and jointing material, compaction of the trench to the density specified, equipment and incidentals necessary to complete the work in accordance to plans and specifications.
3. **ASPHALT PAVEMENT REPAIR:** When called for in the proposal, shall be measured and paid from EDGE OF SAWCUT TO EDGE OF SAWCUT, per SQUARE FOOT (S.Y.) for the **constructed length and width laid in accordance with Typical Details**, for depth indicated on the plans, and maintenance of driveway access to homes along work route during construction. NO ADDITIONAL PAYMENT SHALL BE MADE FOR ADDITIONAL REPAIRS RESULTING FROM UNEVEN EDGES CAUSED BY CONTRACTOR, REQUIRING SQUARED EDGES, measured with a surveyor's flat steel chain, for the TYPE AND COMPACTED THICKNESS SPECIFIED, and shall include new FLEXIBLE BASE COURSE, PRIME COAT, and HOT-MIX ASPHALTIC CONCRETE (HMAC) or CONCRETE

(depending on surrounding conditions), including grading and compaction, as shown in the plans and specifications.

4. **REINFORCED CONCRETE VALLEY GUTTERS:** When called for in the proposal shall be measured and paid per SQUARE FOOT (S.F) for the **constructed length and width in accordance with Typical Details**, including fillets, joints, tie-ins to the limits shown on the plans, all necessary labor, excavating, backfilling, steel reinforcement, concrete of thickness and strength specified, concrete curb and gutter as shown in the plans and specifications, all complete in place. ***(Reinforced Concrete Valley Gutters shall be laid over prepared base and subgrade as indicated in the typical sections. The prepared base and subgrade shall be paid for within the subgrade and flexible base items).***
5. **MANHOLES:** When called for in the proposal, shall be measured and paid per EACH (EA.) regardless of depth, including all labor, equipment, materials (including but not limited to new frames and grates, rings and covers, adjusting rings, cone sections, riser sections, gaskets, drop piping and fittings, bases, pipe-to-manhole connectors, concrete, reinforcing steel, non-shrink grout, mortar, joint wrap where specified to complete the work in accordance with plans and specifications.
6. **CURB INLETS and INLET REMOVAL:** When called for in the proposal, shall be measured and paid per EACH (EA.), complete with curb inlets, frames, gratings, traps, and including excavation, lagging, backfilling, restoration of surrounding pavement and/or curb , capping of drain lines as necessary, and other incidental work necessary or required for a complete satisfactory installation, where shown on the plans or where directed, and in accordance with plans and specifications.
7. **DEWATERING SYSTEM:** When called for in the proposal, shall be measured and paid for per LUMP SUM (L.S.) and shall include all subsidiary items (wellpoints, pumping, etc.) Contractor shall submit Dewatering Plan to Engineer for approval prior to beginning operations.
8. **TRENCH SAFETY SYSTEM:** When called for in the proposal shall be measured and paid for per LINEAL FOOT (L.F.), measured with a flat surveyors chain along the centerline of the pipe laid and shall include all shoring, bracing, materials, equipment, daily maintenance and inspection of equipment, safety instructions to installers and laborers, slope backs, safety equipment, ladders, barricades, etc., and the requirements in the Trench Safety System Specifications, all to accomplish a safe and secure trench opening during pipe installation.
9. **TRAFFIC CONTROL:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary materials, labor, barricades, flagmen and construction signs as required in the Traffic Control Plan including all necessary regular inspection and maintenance of barricades and signage all in accordance with the plans and in conformance the Permit Instructions as applicable and TRAFFIC CONTROL PLAN (as prepared by a Registered Professional Engineer and approved by the Project Engineer, which cost is subsidiary to this Item), including all necessary traffic control for temporary road closures, detours, as approved by the Project Engineer, all in accordance with the TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD, latest edition).

10. **STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND STORMWATER PERMIT:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary plan preparation as required by the City, County, State and Federal guidelines. Plan shall include, but not be limited to, Site Evaluation, Assessment, Planning, Inspections, Erosion and Sediment Control Best Management Practices (BMPs), Post Construction BMPs, Inspections, Recordkeeping, Training and Final Stabilization. Plan must be submitted and approved by appropriate regulatory agency and Engineer, and shall include preparation, filing and submittal (including permit fees), of Notice of Intent (NOI), Notice of Change (NOC) if required, and Notice of Termination (NOT).
11. **EROSION CONTROL DEVICES:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary installation of devices such as construction Entrances/Exits, silt fences, inlet sediment control screens, socks or any other subsidiary items, replacement and/or maintenance as needed during the length of construction and removal of devices upon project completion as required and in accordance with requirements under the Stormwater Pollution Prevention Plan (SWPPP).
12. **CLEANING AND INSPECTION OF LINES:** When called for in the proposal, shall be measured and paid per LINEAR FOOT (L.F.), and shall include complete cleaning, internal inspection and television monitoring including all labor, materials, equipment, bypass plumbing, dewatering and any other associated work, and disposal of all material removed.
13. **WATERLINE CONFLICT REPAIRS AND SERVICE RECONNECTIONS:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), including waterline conflicts which may include repairs to asbestos pipe with PVC, (as per City of Edinburg requirements) including fittings, couplings, and all other associated work.
14. **SANITARY SEWER REPAIRS/ADJUSTMENTS:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.) and shall include locating and adjusting, replacement of concrete rings and covers (as per City of Edinburg requirements), risers, grade adjustment, and any other associated work.

SPECIAL PROVISIONS

IN ALL CASES WHERE THESE SPECIAL PROVISIONS CONFLICT WITH THE TECHNICAL SPECIFICATION SECTIONS, GENERAL CONDITIONS OF THE AGREEMENT, SUPPLEMENTARY GENERAL CONDITIONS, CONTRACT CONDITIONS, OR ANY OTHER DOCUMENT CONTAINED HEREIN, THESE SPECIAL PROVISIONS SHALL GOVERN.

1. The CONTRACTOR shall do all necessary excavation, trenching, demolition, grading, backfill, etc., to complete the project. All excavation is unclassified. All material removed such as concrete, broken pipe, excess backfill, etc., shall become the property of the CONTRACTOR and he shall be responsible for removing it from the site at not extra expense to the OWNER. Any existing material deemed salvageable by the ENGINEER or the OWNER shall be carefully removed and hauled to a designated location as directed by the OWNER or ENGINEER within the City at no extra expense to the OWNER.
2. The CONTRACTOR shall be limited only to existing ROW for operations and/or easements provided by the OWNER. The CONTRACTOR at no extra cost to the OWNER will correct any damages done to property outside these designated work areas to its original or better conditions. It is important that the CONTRACTOR be aware of the work limits so that no damage can result to those areas outside these limits.
3. All trees, plants, grass and shrubs, except those which will be affected by construction shall be protected at all times. The areas in and adjacent to the construction site shall be restored to their original conditions after necessary fine grading is completed. The CONTRACTOR shall provide new grass of the same type removed to restore damaged areas. Only quality sandy loam topsoil shall be used for filling the top four inches of those areas damaged or filled.
4. Existing lawns are to remain intact as far as practical. The CONTRACTOR shall duly restore such areas disturbed to as good or better than original condition using the same type of grass, shrubs, or cover as the original. The CONTRACTOR shall be responsible for correcting any erosion that occurs at his cost without claim for extra compensation.
5. Damages done to existing utilities, power poles, fences, signs, mailboxes, driveways, culverts, pavement, drainage systems, etc. shall be repaired by the CONTRACTOR at no cost to the OWNER, and such costs shall be subsidiary to the various unit items in the Proposal.
6. The OWNER shall provide all testing. Testing shall be paid by the OWNER on all necessary testing selected by ENGINEER, but re-testing shall be charged to the

CONTRACTOR from his monthly estimates, and no additional compensation will be made or allowed for reworking the necessary defective work not meeting the specified work of the plans and specifications. Any re-testing required by no-passing results shall be paid for by the CONTRACTOR and shall be deducted from the contract amount. The ENGINEER, at his sole discretion, may require the CONTRACTOR to perform any necessary uncovering of any improvements to verify compliance with specifications by either visual observation or materials testing at no extra expense to the OWNER.

7. The CONTRACTOR shall furnish the Site Inspector and Observer, OWNER, and ENGINEER the names, address and telephone numbers of all personnel responsible for the work in case of Emergencies.
8. The successful CONTRACTOR shall attend a Pre-Construction Conference with the OWNER and ENGINEER at the date and time specified.
9. The CONTRACTOR shall submit to the ENGINEER a proposed sequence of work outline with approximate completion dates to be reviewed at the pre-construction conference. During the course of construction, the ENGINEER may request updates to the schedule indicating the start of the several part of the work and the estimated dates of completion of the several parts. Unless otherwise noted on the plans, the ENGINEER may require modification of construction schedule to meet any OWNER recognized or OWNER sponsored events which may be affected by the CONTRACTOR'S activities without claim for extra compensation.
10. It is important that traffic be interrupted at a minimum during construction. Prior to any **Public Road Closures**, a Traffic Control Plan (TCP), prepared by a Registered Professional Engineer, must be submitted by the CONTRACTOR and written approval must be issued by the ENGINEER and OWNER. The OWNER may, at its sole discretion, require continuous operation of construction activities to minimize traffic interruption. The preparation and submittal of the TCP, its approval process, or continuous operation requirement shall not constitute a claim for additional compensation or time extension of the Project.
11. The CONTRACTOR is solely responsible for notifying the Engineering Department, Police Department, Fire Department, School District, Emergency Services, and other interested entities at least 48 hours in advance of any OWNER approved road closures or detours.
12. All traffic control devices shall be in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD), latest edition.
13. All work must be performed during regular business hours of 8 a.m. to 5 p.m., Monday thru Friday, except OWNER recognized holidays. It is the CONTRACTOR'S sole responsibility to complete all work within the time specified in the Contract during the designated hours of operation. The CONTRACTOR may

request work outside these hours, but will require the presence of the City's Field Inspector, the cost of which will be borne by the CONTRACTOR. No cost for the OWNER'S Field Representative will be charged should the work be requested by the OWNER.

14. The CONTRACTOR shall be responsible for construction staking for the entire project and shall be done in accordance with the Specifications. The OWNER shall provide horizontal and vertical control. Staking shall be performed by a Registered Professional Land Surveyor or Professional Engineer qualified to do such construction staking at no additional cost to the OWNER. CUT SHEETS shall be submitted to the ENGINEER and OWNER for review and approval.
15. The Plans show approximate locations of existing utilities including gas lines, telephone lines, power lines, water lines, sewer lines, storm sewers and irrigation lines within the vicinity. The CONTRACTOR is responsible for locating all existing utilities and shall exercise extreme care in working in the vicinity of these lines. The CONTRACTOR shall notify the Utility Companies while working in the vicinity of the corresponding private or public utilities.
16. All existing lines, whether belonging to the Public or Private shall remain in operation at all times. Switchover time, re-connecting new service from existing lines or services (if any) shall be kept to a minimum. Unless otherwise shown as a Bid Item, reconnections to existing water and sanitary sewer services shall be subsidiary to all items of the Bid Proposal at no additional cost to the OWNER.
17. The OWNER reserves the right to add or delete quantities of bid items in the Proposal at the Unit Prices given, provided however that such additions or reductions are within the aggregate limits specified in the General Conditions of the Agreement. No additional compensation will be made to the CONTRACTOR for increases in quantities resulting from deviations from the dimensions of the plans unless such deviation is approved in writing and in accordance with the Change Order provisions of the Contract Documents.
18. The CONTRACTOR is expected to conduct his work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. CONTRACTOR shall provide ENGINEER and OWNER an Erosion Control Plan (ECP) as part of a permit application to be completed and approved by the ENGINEER prior to commencement of work. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the Plans, to preclude erosion of the soil. Such operations should be times consistent with the actual need for doing the work and only to leave raw, unprotected surfaces for a minimum of time. The preparation and submittal of the ECP or its approval process shall not constitute a claim for additional compensation or time extension of the Project.
19. Until acceptance by the ENGINEER of any part of all of the material, as provided for in these specifications, it shall be under the charge and care of the CONTRACTOR,

and he shall take every necessary precaution against injury or damage to any part of the material by action of the elements of the non-execution of the work. The CONTRACTOR shall rebuild, repair, restore and make good, at his own expense, all injuries or damage to any portion of the material occasioned by any of the above causes before its completion and acceptance.

20. In cases where the CONTRACTOR deems extra compensation is due him for materials not clearly covered in the contract, or not ordered by the ENGINEER as an extra item, the CONTRACTOR shall notify the ENGINEER in writing of his intention to make claim for such extra compensation before he begins the work. The CONTRACTOR shall not proceed until the OWNER, ENGINEER, and CONTRACTOR approves a written CHANGE ORDER. Failure on the part of the CONTRACTOR to give such notification or to afford the ENGINEER proper facilities for keeping strict account of actual cost shall constitute a waiver of the claim for such extra compensation. The filing of such notice by the CONTRACTOR and the keeping of costs by the ENGINEER shall not in any way be construed to prove the validity of the claim. When the work has been completed, the CONTRACTOR shall, within 10 days, file his claim for extra compensation with the ENGINEER.
21. Upon the failure of the CONTRACTOR to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized, or condemned materials immediately after receiving written notice from the ENGINEER, the OWNER may recover for such defective materials on the CONTRACTOR'S bond, or by action in a court having proper jurisdiction over such matters, or may employ labor and equipment and satisfactorily repair or remove and replace such work and charge the cost of the same to the CONTRACTOR, which cost will be deducted from any money due him.
22. The CONTRACTOR shall warrant all work for a period of not less than one (1) year from the date of final acceptance of the work by the ENGINEER. CONTRACTOR is responsible for scheduling a final inspection in the presence of the OWNER, ENGINEER, and CONTRACTOR, whereupon all items must be in accordance with plans and specifications prior to final acceptance.
23. All asphalt pavement repairs shall be completed as per the construction plans and specifications. The CONTRACTOR shall not leave any area requiring repairs in excess of 1,300 square yards or in excess of 30 days, whichever is less. The OWNER or ENGINEER may require immediate asphalt pavement repair should traffic conditions warrant. Failure by the CONTRACTOR to make the necessary repairs within the time specified by the OWNER may result in corrective action by the OWNER including the employ of materials, labor and equipment to satisfactorily perform such work and charge the cost of the same to the CONTRACTOR, which cost will be deducted from any money due him.

SECTION IV
STANDARD OF PERFORMANCE

Contractor warrants to City that all labor furnished to perform the Work under the Contract Documents will be competent to perform the tasks undertaken, that the product of such labor will yield only first-class results, that materials and /or equipment furnished will be of good quality and new unless otherwise permitted by the Contract Documents, and that the Work will be of good quality and workman like manner, free from faults and defects, and in strict conformance with the Contract Documents. Any Work not strictly conforming to these requirements shall be considered defective.

SECTION V
TERMS OF PAYMENT

City agrees to pay Contractor for services herein contracted for as follows:

- A. Payment for basic services shall be upon thirty (30) days of receipt of invoice by City. Invoice shall be submitted to City upon completion and inspection of each project in accordance with the contract Documents in the amount not to exceed \$ _____.
- B. Invoice shall be completed and processed in accordance with City regulations. Contractor shall submit Applications for Payment in accordance with the City policies. Application for Payment will be processed by the City of Edinburg Public Works Department.
- C. City shall authorize all payments made for services rendered. Payment terms shall be net thirty (30) days from receipt of invoice.
- D. If changes in plans or specifications are necessary after the performance of the contract is begun or if it is necessary to decrease or increase the quantity of work to be performed or of materials, equipment, or supplies to be furnished, the governing body of the municipality must approve change orders before making the changes in accordance with City Code of Ordinance and applicable sections of the Texas Local Government Code and Texas Government Code.
- E. The total contract price may not be increased because of the changes unless additional money for increased costs is appropriated for that purpose from available funds or is provided for by the authorization of the issuance of time warrants.

SECTION VI
TIME OF COMPLETION

City and the Contractor recognize that time is of the essence of this agreement and that the City may suffer financial loss if the WORK is not completed within the time specified in Section III herein, plus any extensions thereof allowed in accordance with RFP #2019-08 South East Original Townsite Drainage Improvements. Accordingly, instead of requiring any such proof, the City and the Contractor agree that not as a penalty, but as added expense for Engineering/Architectural supervision the Contractor shall pay the City for each day that expires after the time specified in Section III herein the amount corresponding below:

<u>FOR AMOUNT OF CONTRACT</u>	<u>COST PER DAY</u>
\$ 5,000.00 to \$ 25,000.00	\$100.00
\$ 25,001.00 to \$ 100,000.00	\$200.00
\$ 100,001.00 to \$ 500,000.00	\$250.00
\$ 500,001.00 to \$1,000,000.00	\$300.00
\$1,000,001.00 to \$2,000,000.00	\$400.00
\$2,000,001.00 to \$3,000,000.00	\$500.00
\$3,000,001.00 to \$4,000,000.00	\$600.00
\$4,000,001.00 to \$5,000,000.00	\$700.00
\$5,000,001.00 and over	\$800.00

SECTION VII
SCHEDULE REQUIREMENTS

Whenever, in the opinion of City, the Work falls behind schedule, the Contractor shall, to the extent necessary to meet said schedule, increase its labor force and/or provide overtime, Saturday, and Sunday and/or holiday work, and shall have each Subcontractor do likewise, all at no additional cost to or compensation from City. Further, City shall have the right to offset against any amounts then or thereafter due to the Contractor, or to be reimbursed by the Contractor for, any additional costs City may incur as a direct result of said increase in labor force or overtime, Saturday, Sunday, and/or holiday work.

SECTION VIII
WRITTEN NOTICE OF ISSUE

In the event that any issue arises relating to any of the provisions contained in this Agreement, including, but not limited to potential delays, change orders, time extensions, weather delays, etc., Contractor agrees to notify the City, in writing, immediately, relating to such issue and proposed resolution. Failure to give such notice shall constitute a waiver of any other remedies available to Contractor hereunder.

SECTION IX
NO DAMAGE FOR DELAY

In the event of any delay, not the fault of the Contractor, the Contractor shall be entitled to an extension of time for completion only, and shall not be entitled to any additional payment on account of such delay. Without limiting the foregoing, the Contractor shall not be entitled to payment or compensation of any kind from the

City for direct, indirect or impact damages, and/or consequential damages, including but not limited to costs of acceleration arising because of hindrance or from any cause or whatsoever, whether such hindrances or delays be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable.

SECTION X UNREASONABLE SITE INSPECTION REQUIREMENTS

The Contractor acknowledges that it has taken steps necessary to ascertain the nature and location of the Work and that it has investigated and satisfied itself as to the general and local conditions which can affect the Work and its costs. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered or difficulties or access insofar as this information is ascertainable from an inspection of the site, and available documents, including all information from exploratory work done by the City and its design consultants as well as from the Drawings and Specifications made a part of this Contract. The Contractor has the right to make any additional tests necessary to assure itself that the site conditions are satisfactory for the work contemplated.

SECTION XI DUTY TO COORDINATE AMONG SEPARATE PRIME CONTRACTORS

The City reserves the right to engage separate contractors to perform aspects of the Project other than the Work under this Agreement. In such case, contractor shall coordinate sequence and schedule its work together and in cooperation with such other contractors. In the event of any difficulties caused by any such other separate contractor, this contractor shall look solely for relief to such other contractors and shall not make claim against City.

SECTION XII CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between City and Contractor concerning the WORK consist of this Agreement and the following attachments to this Agreement:

- Notice to Bidders
- Addenda (Index)
- Instructions to Bidders
- Proposal Forms including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits
- Special Provisions
- Agreement for Engineering/Architectural Construction
- Performance Bond
- Payment Bond
- General Conditions of Contract for Engineer/Architectural Construction
- Affidavit and Waiver of Lien Prime Contractor
- Affidavit of Release and Waiver by Subcontractor and Material Vendor

- Contractor's Affidavit as to Status of Lien
- Technical Specifications, as listed in the Table of Contents.
- Drawings
- Change Orders which may be delivered or issued after Effective Date of the Agreement and are not attached hereto.

Said attachments to be delivered before final payment is due. There are no Contract Documents other than those listed in this Section. The Contract Documents may only be amended by Change Order pursuant to the City's policies and or regulations.

SECTION XIII ASSIGNMENT

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

SECTION XIV NON-APPROPRIATIONS

Notwithstanding anything in the contract documents to the contrary, any and all payments which the City is required to make under this contract shall be subject to annual appropriation or other availability of funds, as certified by the Director of Finance.

If the City cannot appropriate sufficient funding, then either party has the right to terminate the contract by providing (10) ten days written notice to the other party.

Furthermore, execution of this contract does not automatically guarantee a renewal of contract upon expiration.

SECTION XV MINIMUM INSURANCE REQUIREMENTS

In accordance with City ordinances, Contractor shall be required to hold the following minimum insurance coverage throughout the duration of this Agreement:

- A. Workers Compensation-
In accordance with the State statute
- B. Employer's Liability
Bodily Injury by Accident: \$100,000 each accident

Bodily Injury by Disease: \$100,000 each employee
\$500,000 policy limits

C. Comprehensive General Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence
Property Damage \$100,000 each occurrence
\$100,000 aggregate

-or- \$500,000 combined single limits

D. Comprehensive Auto Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence
Property Damage \$100,000 each occurrence
\$100,000 each aggregate

-or- \$500,000 combined single limits

E. City's Protective Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence
Property Damage \$100,000 each occurrence
\$100,000 each aggregate

-or- \$500,000 combined single limits

Evidence of the above insurance coverage shall be required prior to final execution of the agreement. The City shall be listed as an additional insured.

Contractor warrants that it is adequately insured and carries liability, worker's compensation, and automobile insurance for injury to its employees and others incurring loss or injury as a result of the acts of Contractor or its employees.

Contractor shall not commence work under this agreement until all insurance requirements have been obtained and proof of such insurance shall have been provided to the City, nor shall Contractor allow any Sub-Contractor to commence work until all insurance as noted above has been so obtained and provided to the City. Approval of the insurance by City shall not relieve or decrease the liability of the Contractor.

SECTION XVI
TERMINATION OF CONTRACT

Either party to this agreement shall have the right to terminate this contract at any time, and for any reason, after 30 days' written notice and any payment requested shall be made on work completed and/or goods delivered and as provided for in the contract.

SECTION XVII
SEVERABILITY

If any term or provision of this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions of this Agreement shall remain in full force and effect and shall in no way be affected, impaired or invalidated.

SECTION XVIII
ALTERNATE DISPUTE RESOLUTION/NEUTRAL PARTY

- A. Any controversy, claim or dispute between the parties arising out of or relating to the provisions of this Agreement or the breach, termination or validity thereof shall, upon written request of either party, immediately be referred jointly for resolution of the controversy by non-binding mediation.
- B. The mediation must be concluded within any period mutually agreed upon by the parties but in no event no later than within forty-five (45) days after written notice is given by either party of its intent to proceed to mediation. Unless the parties expressly agree otherwise, each party shall bear its own costs, legal and expert fees incurred in the mediation, and evenly share the costs of the mediator. If, after proceeding in good faith the parties, with the assistance of a neutral mediator, do not resolve the dispute within the forty-five (45) day period, the parties may proceed in accordance with paragraph (C) below.
- C. After exhausting the procedures set forth above, either party may initiate litigation to resolve the dispute. The Law of the State of Texas shall control the matter in controversy. Venue is mandatory in a State Court Hidalgo County, Texas.

SECTION XIX
NOTICE

All notices or other communications required under this Agreement may be affected either by personal delivery in writing or by Certified Mail, Return Receipt Requested. Notice shall be deemed to have been given when delivered or mailed to the parties at their respective addresses as set forth below or when mailed to the last address provided in writing to the other party by the addressee.

SECTION XX
IDEMNIFICATION

- A. Contractor agrees to and shall indemnify and hold harmless and defend the City of Edinburg, Texas, its elected and appointed officers, agents and employees from any and all claims, losses, causes of action and damages, suits and liability of every kind, including all expenses of litigation, court costs, and attorney's fees for injury to or death to any person or for damage to any property, arising out of or directly connected with the negligent operation of the Contractor, its agents, officers and employees, carried out in furtherance of this agreement.

B. Contractor agrees to assist City in defense of claims or litigation brought against the City related to this agreement, including any claims related to services.

**SECTION XXI
CONFLICT OF TERMS**

In the Event that there is any conflict or inconsistency between the terms and conditions of this Agreement, and those of the exhibits and attachments to this agreement, the terms and conditions of this Agreement, shall control and govern the rights and obligations of the parties. All other provisions of exhibits and attachments to this agreement not specifically in conflict with this Agreement shall remain the same.

**SECTION XXII
MISCELLANEOUS**

Any changes to this document must be approved by City and signed by both parties to the agreement.

EXECUTED by the parties in triplicate originals on this _____ day of _____, 2018.

CITY OF EDINBURG:

BY: _____
Juan G Guerra, CPA, City Manager
City of Edinburg
415 W. University Dr.
Edinburg, Texas 78541
Phone: (956)383-5661
Fax: (956)383-7111

ATTEST:

BY: _____
Ludivina Leal, City Secretary

APPROVED AS TO FORM:

OXFORD AND GONZALEZ

BY: _____
Ricardo Gonzalez,
City Attorney

NAME OF COMPANY

BY: _____

Name

Title

Address

City, State, Zipcode

Phone:

Fax:

Email:

ATTACHMENTS: Exhibit A: Scope of Work
Exhibit B: Certificates of Insurance
Exhibit C: RFP 2019-08
Exhibit D

SAMPLE

PERFORMANCE BOND

STATUTORY PERFORMANCE BOND PURSUANT TO ARTICLE 2253
OF THE TEXAS LOCAL GOVERNMENT CODE AS AMENDED BY ACTS OF THE 1993,
73RD LEGISLATURE, CH. 268, § 1, EFF. SEPT. 1, 1993

KNOW ALL MEN BY THESE PRESENTS, THAT _____

(hereinafter called the Principal(s), as Principal(s), and _____

(hereinafter called the Surety(s), as Surety(s), are held and firmly bound unto _____

(hereinafter called the Obligee), in the amount of _____

_____ Dollars (\$ _____)

for the payment whereof the said Principal and Surety bind themselves, and their heirs,
administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the

_____ day of _____, 20_____, for the _____

PERFORMANCE BOND Continued:

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

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with plans, specifications and contract documents, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Statutory Performance Bond Pursuant To Article 2253 of the Texas Local Government Code as Amended by Acts of the 1993, 73rd Legislature, Ch. 268, § 1, Eff. Sept. 1, 1993, , and all liabilities on this bond shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, this instrument is executed in four counterparts, each one of which shall be deemed an original, this the _____ day of _____ A.D., 20____.

Principal

ATTEST:

(Principal) Secretary
(SEAL)

Signature

Witness as to Principal

(Print/Type Name)

(Address)

(Address)

ATTEST:

Surety

(Surety) Secretary
(SEAL)

Attorney-in-Fact (Signature)

Witness as to Surety

(Print/Type Name)

(Address)

(Address)

NOTE: Date of Bond must not be prior to date of Contract

- (1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

PAYMENT BOND

STATUTORY PAYMENT BOND PURSUANT TO ARTICLE 2253
OF THE TEXAS LOCAL GOVERNMENT CODE AS AMENDED BY ACTS OF THE 1993,
73RD LEGISLATURE, CH. 268, § 1, EFF. SEPT. 1, 1993

KNOW ALL MEN BY THESE PRESENTS, that _____

(hereinafter called the Principal(s), as Principal(s), and _____

(hereinafter called the Surety(s), as Surety(s), are held and firmly bond unto _____

(hereinafter called the Oblige), in the amount of _____

_____ Dollars (\$ _____)

for the payment whereof, the said Principal and Surety bind themselves, and their heirs,
administrators, executors, successors and assigns, jointly severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Oblige,
dated the _____ day of _____, 20_____, to

PAYMENT BOND Continued:

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

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

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Statutory Payment Bond Pursuant To Article 2253 of the Texas Local Government Code as Amended by Acts of the 1993, 73rd Legislature, Ch. 268, § 1, Eff. Sept. 1, 1993, , and all liabilities on this bond shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, this instrument is executed in four counterparts, each one of which shall be deemed an original, this the _____ day of _____ A.D., 20_____.

Principal

ATTEST:

(Principal) Secretary
(SEAL)

Signature

Witness as to Principal

(Print/Type Name)

(Address)

(Address)

ATTEST: _____

Surety

(Surety) Secretary
(SEAL)

Attorney-in-Fact (Signature)

Witness as to Surety

(Print/Type Name)

(Address)

(Address)

NOTE: Date of Bond must not be prior to date of Contract

- (1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

GENERAL CONDITIONS

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ARTICLE 1 -- DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated in this Article 1 which meanings are applicable to both the singular and plural thereof. If a word which is entirely in upper case in these definitions is found in lower case in the Contract Documents, then the lower case word will have its ordinary meaning.

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement -The written contract between the OWNER and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form accepted by the ENGINEER which is to be used by the CONTRACTOR to request progress payments or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

Asbestos -Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid -The offer or proposal of the Bidder submitted on the prescribed form setting forth the price or prices for the WORK.

Bonds - Bid, Performance, and Payment Bonds and other instruments of security.

Change Order -A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the OWNER, and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

Clarification -A document issued by the ENGINEER to the CONTRACTOR that interprets the requirement(s) and/or design intent of the Contract Documents, which may not represent an addition, deletion, or revision in the WORK or an adjustment in the Contract Price or the Contract Times.

Contract Documents- The Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates, affidavits and other documentation), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specifications, Drawings, all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents. Shop Drawings are not Contract Documents.

Contract Price- The total monies payable by the OWNER to the CONTRACTOR under the terms and conditions of the Contract Documents.

Contract Times - The number or numbers of successive calendar days or dates stated in the Contract Documents for the completion of the WORK.

CONTRACTOR -The individual, partnership, corporation, joint-venture, or other legal entity with whom the OWNER has executed the Agreement.

Day- A calendar day of 24 hours measured from midnight to the next midnight.

Defective Work - Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the ENGINEER's recommendation of final payment.

Drawings -The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and which have been prepared by the ENGINEER and are included and/or referred to in the Contract Documents. Shop Drawings are not Drawings as so defined.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER - The individual, partnership, corporation, joint-venture, or other legal entity named as such by the OWNER as set forth in the Supplementary General Conditions.

Field Order -A written order issued by the ENGINEER which may or may not involve a change in the WORK.

General Requirements - Division 1 of the Technical Specifications.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

Laws and Regulations; Laws or Regulations -Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

Lien or Mechanic's Lien - A form of security, an interest in real property, which is held to secure the payment of an obligation. When related to public works construction, Lien or Mechanic's Lien may be called Stop Notice.

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date of a separately identifiable part of the WORK or a period of time within which

the separately identifiable part of the WORK should be performed prior to Substantial Completion of all the WORK.

Notice of Award -The written notice by the OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein within the time specified, the OWNER will enter into an Agreement.

Notice of Completion - A form signed by the ENGINEER and the CONTRACTOR recommending to the OWNER that the WORK is Substantially Complete and fixing the date of Substantial Completion. After acceptance of the WORK by the OWNER's governing body, the form is signed by the OWNER and filed with the County Recorder. This filing starts the 30 day lien filing period on the WORK.

Notice to Proceed -The written notice issued by the OWNER to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK and establishing the date of commencement of the Contract Times.

OWNER - The public body or authority, corporation, association, firm, or person with whom the CONTRACTOR has entered into the Agreement and for whom the WORK is to be provided.

Partial Utilization - Use by the OWNER of a substantially completed part of the WORK for the purpose for which it is intended prior to Substantial Completion of all the WORK.

PCBs - Polychlorinated biphenyls.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

Project -The total construction project of which the WORK to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Radioactive Material - Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

Resident Project Representative - The authorized representative of the ENGINEER who is assigned to the Site or any part thereof.

Samples -Physical examples of materials, equipment, or workmanship that are representative of some portion of the WORK and which establish the standards by which such portion of the WORK will be judged.

Shop Drawings - All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR to illustrate some portion of WORK.

Site - Lands or other areas designated in the Contract Documents as being furnished by the OWNER for the performance of the construction, storage, or access.

Specifications - (Same definition as for Technical Specifications hereinafter).

Stop Notice - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the OWNER. In some states, for public property, the Stop Notice remedy is designed to substitute for a mechanic's lien.

Subcontractor -An individual, partnership, corporation, joint-venture, or other legal entity having a direct contract with the CONTRACTOR or with any other Subcontractor for the performance of a part of the WORK at the Site.

Substantial Completion - The time at which the WORK (or specified part) has progressed to the point where it is sufficiently complete, in accordance with the Contract Documents, as evidenced by Notice of Completion (or Notice of Partial Utilization) so that the WORK (or specified part) can be utilized for the purposes for which it is intended; or, if no such notice is issued, when final payment is due in accordance with Paragraph 14.8. The terms "substantially complete" and "substantially completed" as applied to any work refer to substantial completion thereof.

Supplementary General Conditions -The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, distributor, materialman, or vendor having a direct contract with the CONTRACTOR or with any Subcontractor to furnish materials, equipment, or product to be incorporated in the WORK by the CONTRACTOR or any Subcontractor.

Technical Specifications - Divisions 1 through 17 of the Contract Documents consisting of the General Requirements and written technical descriptions of products and execution of the WORK.

Utilities - All pipelines, conduits, ducts, cables, wires, tracks, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground or above the ground to furnish any of the following services or materials: water, sewage, sludge, drainage, fluids, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic control, or other control systems.

WORK -The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

ARTICLE 2 -- PRELIMINARY MATTERS

2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES

- A. When the CONTRACTOR delivers the signed Agreement to the OWNER, the CONTRACTOR shall also deliver to the OWNER such Bonds and insurance policies and certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.

2.2 COPIES OF DOCUMENTS

- A. The OWNER will furnish to the CONTRACTOR the required number of copies of the contract Documents specified in the Supplementary General Conditions.

2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED

- A. The Contract Times will start to run on the commencement date stated in the Notice to Proceed.

2.4 STARTING THE WORK

- A. The CONTRACTOR shall begin to perform the WORK on the commencement date stated in the Notice to Proceed, but no work shall be done at the Site prior to said commencement date.
- B. Before undertaking each part of the WORK, the CONTRACTOR shall review the Contract Documents in accordance with Paragraph 3.3.

2.5 PRECONSTRUCTION CONFERENCE

- A. The CONTRACTOR is required to attend a preconstruction conference. This conference will be attended by the OWNER, ENGINEER, and others as appropriate in order to discuss the WORK in accordance with the applicable procedures specified.
- B. The CONTRACTOR's initial schedule submittals for shop drawings, obtaining permits, and Plan of Operation and Schedule will be reviewed and finalized. As a minimum, the CONTRACTOR's representatives should include its project manager and schedule expert. The CONTRACTOR should plan on this meeting taking no less than 3 hours. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first Application for Payment. No Application for Payment will be processed prior to receiving acceptable initial submittals from the CONTRACTOR.

ARTICLE 3 -- INTENT AND USE OF CONTRACT DOCUMENTS

3.1 INTENT

- A. The Contract Documents comprise the entire agreement between the OWNER and the CONTRACTOR concerning the WORK. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State in which the Project is located.
- B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not called for specifically.
- C. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning unless a definition has been provided in Article 1 of the General Conditions.

3.2 REFERENCE TO STANDARDS

- A. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code shall be effective to change the duties and responsibilities of the OWNER, the CONTRACTOR, the ENGINEER, or any of their consultants, agents, or employees, from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER, or any of ENGINEER's consultants, agents, or employees any duty or authority to direct the performance of the WORK or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.3 REVIEW OF CONTRACT DOCUMENTS

- A. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual, or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once, and CONTRACTOR shall not proceed with the work affected thereby (except in an emergency as authorized by Paragraph 6.12) until a Clarification, Field Order, or Change Order to the Contract Documents has been issued.

3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

- A. In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
1. Permits from other agencies as may be required by law
 2. Change Orders
 3. Agreement
 4. Addenda
 5. Contractor's Bid (Bid Form)
 6. Special Provisions
 7. Notice to Bids
 8. Instructions to Bidders
 9. Supplementary General Conditions
 10. General Conditions
 11. Technical Specifications
 12. Referenced Standard Specifications
 13. Drawings
- B. With reference to the Drawings the order of precedence is as follows:
1. Figures govern over scaled dimensions
 2. Detail drawings govern over general drawings
 3. Addenda/Change Order drawings govern over any other drawings
 4. Drawings govern over standard drawings

3.5 AMENDING CONTRACT DOCUMENTS

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10).

3.6 REUSE OF DOCUMENTS

- A. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent of OWNER.

ARTICLE 4 -- SITE OF THE WORK

4.1 AVAILABILITY OF LANDS

- A. The OWNER will furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the OWNER until a written temporary construction easement agreement has been executed by the CONTRACTOR and the property owner, and a copy of said easement furnished to the ENGINEER prior to said use; and, neither the OWNER nor the ENGINEER will be liable for any claims or damages resulting from the CONTRACTOR's trespass on or use of any such properties. The CONTRACTOR shall provide the OWNER with a signed release from the property owner confirming that the lands have been satisfactorily restored upon completion of the WORK.

4.2 REPORTS OF PHYSICAL CONDITIONS

- A. Subsurface Explorations: Reference is made to the Supplementary General conditions for identification of those reports of explorations and tests of subsurface conditions at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.
- B. Existing Structures: Reference is made to the Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except underground Utilities referred to in Paragraph 4.3 herein) which are at or contiguous to the Site that have been utilized in the preparation of the Contract Documents.
- C. Neither the OWNER nor ENGINEER makes any representation as to the completeness of the reports or drawings referred to in Paragraph 4.2 A or B above or the accuracy of any data or information contained therein. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports and drawings. However, the CONTRACTOR may not rely upon any interpretation of such technical data, including any interpolation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.

4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

- A. Indicated: The information and data indicated in the Contract Documents with respect to existing underground Utilities at or contiguous to the Site are based on information and data furnished to the OWNER or the ENGINEER by the owners of such underground Utilities or by others. Unless it is expressly provided in the Supplementary General

Conditions and/or Section 01011 – Site Conditions, the OWNER and the ENGINEER will not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of all of which are deemed to have been included in the Contract Price.

- B. Not Indicated: If an underground Utility is uncovered or revealed at or contiguous to the Site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such underground Utility and give written notice thereof to that owner and shall notify the ENGINEER in accordance with the requirements of the Supplementary General Conditions and Section 01011 – Site Conditions.

4.4 DIFFERING SITE CONDITIONS

- A. The CONTRACTOR shall notify the ENGINEER, in writing, of the following unforeseen conditions, hereinafter called differing Site conditions, promptly upon their discovery (but in no event later than 14 days after their discovery) and before they are disturbed:
 - 1. Subsurface or latent physical conditions at the Site of the WORK differing materially from those indicated, described, or delineated in the Contract Documents, including those reports discussed in Paragraph 4.2, 4.3, and 4.5; and
 - 2. Unknown physical conditions at the Site of the WORK of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents, including those reports and documents discussed in Paragraph 4.2, 4.3, and 4.5.
- B. The ENGINEER will review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto, and advise the OWNER, in writing, of the ENGINEER's findings and conclusions.
- C. If the OWNER concludes that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the difference.
- D. In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Times, or any combination thereof, will be allowable to the extent that they are attributable to any such difference. If the OWNER and the CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

- E. The CONTRACTOR's failure to give notice of differing Site conditions within 14 days of their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith, whether direct or consequential in nature.

4.5 HAZARDOUS MATERIALS

- A. Reference is made to the Supplementary General Conditions for identification of those reports and drawings relating to Asbestos, Hazardous Waste, PCBs, Petroleum and/or Radioactive Material identified at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.
- B. OWNER shall be responsible for any Asbestos, Hazardous Waste, PCBs, Petroleum, or Radioactive Material uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the WORK and which may present a substantial danger to persons or property exposed thereto in connection with the WORK at the Site. OWNER will not be responsible for any such material brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.
 - 1. Upon discovery of any Asbestos, Hazardous Waste, PCBs, Petroleum, or Radioactive Material, the CONTRACTOR shall immediately stop all work in any area affected thereby (except in an emergency as required by Paragraph 6.12) and notify OWNER and ENGINEER (and thereafter confirm such notice in writing). CONTRACTOR shall not be required to resume any work in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice. Such written notice will specify that such condition and any affected area is or has been rendered safe for the resumption of the work or specify any special conditions under which the work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of adjustment, if any, in Contract Price or Contract Times as a result of such work stoppage or such special conditions under which work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided in Articles 11 and 12.
 - 2. If, after receipt of such special written notice, CONTRACTOR does not agree to resume such WORK based on a reasonable belief it is unsafe, or does not agree to resume such WORK under special conditions, then OWNER may order such portion of the WORK that is in connection with such hazardous condition or in such affected area to be deleted from the WORK. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the WORK then either party may make a claim therefor as provided in Articles 11 and 12. OWNER may have such deleted portion of the WORK performed by OWNER's own forces or others in accordance with Article 7.
- C. To the fullest extent permitted by Laws and Regulations, OWNER will indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's consultants,

and the officers, directors, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages arising out of or resulting from such hazardous condition; provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the WORK itself), including the loss of use resulting therefrom. Nothing in this Paragraph shall obligate OWNER to indemnify a person or entity from and against the consequences of that person's or entity's own negligence.

- D. The provisions of Paragraphs 4.2, 4.3, and 4.4 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material uncovered or revealed at the Site.

4.6 REFERENCE POINTS

- A. The OWNER will provide one bench mark, near or on the Site of the WORK, and will provide two points near or on the Site to establish a base line for use by the CONTRACTOR for alignment control. Unless otherwise specified in the Supplementary General Conditions, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.
- B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks, and in case of their removal or destruction by any party, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by personnel qualified under the applicable state codes governing land surveyors.

ARTICLE 5 -- BONDS AND INSURANCE

5.1 BONDS

- A. The CONTRACTOR shall furnish Performance and Payment Bonds, each in the amount set forth in the Supplementary General Conditions, as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of Substantial Completion, except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.
- B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

- C. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and surety, which must be acceptable to the OWNER.
- D. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State in which the Project is located to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

5.2 INSURANCE

- A. The CONTRACTOR shall purchase and maintain the insurance required under this Paragraph. Such insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by Laws or Regulations, whichever are greater. All insurance shall be maintained continuously during the life of the Agreement up to the date of Substantial Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing Defective Work in accordance with Paragraph 13.5. The CONTRACTOR's liabilities under this Agreement shall not be deemed limited in any way to the insurance coverage required.
- B. All insurance required by the Contract Documents to be purchased and maintained by the CONTRACTOR shall be obtained from insurance companies that are duly licensed or authorized to issue insurance policies for the limits and coverages so required in the State in which the Project is located. Such insurance companies shall have a current Best's Rating of at least an "A" (Excellent) general policy holder's rating and a Class VII financial size category and shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.
- C. The CONTRACTOR shall furnish the OWNER, with copies to each additional insured who is indicated in the Supplementary General Conditions, with certificates and original endorsements showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be canceled, reduced in coverage, or renewal refused until at least 30 days' prior written notice has been given to the OWNER and additional insureds by certified mail. All such insurance required herein (except for worker's compensation and employer's liability) shall name the OWNER, the ENGINEER, and their consultants and subconsultants and their officers, directors, agents, and employees as "additional insureds" under the policies. The CONTRACTOR shall purchase and maintain the following insurance:
 - 1. Workers' Compensation and Employer's Liability: This insurance shall protect the CONTRACTOR against all claims under applicable workers' compensation laws or

- federal acts, including claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This insurance shall include an "all states" endorsement. In the event of a "monopolistic" state, CONTRACTOR shall certify all employees are covered by the state fund or shall provide a separate policy providing "all states" benefits. Employer's liability "stop gap" coverage for monopolistic states shall be provided under either a worker's compensation policy or general liability policy. The CONTRACTOR shall require each subcontractor similarly to provide workers' compensation insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the CONTRACTOR's workers' compensation insurance. In case any class of employees is not protected under the workers' compensation laws, the CONTRACTOR shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance for the protection of such of its employees as are not otherwise protected. The CONTRACTOR and each Subcontractor shall provide a waiver of subrogation in favor of the OWNER and ENGINEER.
2. Comprehensive or Commercial General Liability: This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees or damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees, or subcontractors. The policy shall also include protection against claims insured by personal injury liability coverage and contractual coverage to insure the contractual liability assumed by the CONTRACTOR under the indemnification provisions in the General Conditions. To the extent that the CONTRACTOR's work, or work under its direction, may require blasting, explosive conditions, or underground operations, the comprehensive or commercial general liability coverage shall specifically include coverage relative to blasting, explosion, collapse, and/or underground hazards.
 3. Commercial Automobile Liability: This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the Site of all motor vehicles licensed for highway use, whether they are owned, nonowned, or hired.
 4. Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The CONTRACTOR shall either require each of the Subcontractors to procure and to maintain subcontractor's public liability and property damage insurance and vehicle liability insurance of the type and in the same amounts specified in the Supplementary General Conditions for the CONTRACTOR or insure the activities of the Subcontractors under the CONTRACTOR's own policies.
 5. Builder's Risk:
 - a. This insurance shall be of the "all risks" type, shall be written in completed value form, and shall protect the CONTRACTOR, Subcontractors, the OWNER, and the ENGINEER, against risks of damage to buildings, structures, and materials and equipment (including any stored off-site and while in transit), CONTRACTOR'S equipment, debris removal and including demolition and contingent loss occasioned by enforcement of any applicable legal requirements,

and shall cover reasonable compensation for ENGINEER'S services and expenses required as a result of such insured loss. The amount of such insurance shall be not less than the insurable value of the WORK at completion plus equipment. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER, as their interests may appear. This insurance shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the ENGINEER. This insurance shall insure against all risks of loss (including earthquake, flood and collapse) and, at the option of the OWNER, shall include comprehensive boiler and machinery coverage including coverage for installation and testing.

- b. If the OWNER finds it necessary to occupy or use a portion or portions of the Project prior to Substantial Completion thereof, such occupancy shall not commence prior to the time mutually agreed to by the OWNER and CONTRACTOR and to which the insurance company or companies providing the Builder's Risk Insurance have consented by endorsement to the policy or policies.

ARTICLE 6 -- CONTRACTOR'S RESPONSIBILITIES

6.1 COMMUNICATIONS

- A. Written communications with the OWNER shall be only through or as directed by the ENGINEER.

6.2 SUPERVISION AND SUPERINTENDENCE

- A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and all safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.
- B. The CONTRACTOR shall designate in writing and keep on the Site at all times during the performance of the WORK a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the OWNER and the ENGINEER. The superintendent will be the CONTRACTOR's representative at the Site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR.
- C. The CONTRACTOR's superintendent shall be present at the Site at all times while work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. Failure to observe this requirement shall be considered suspension of the

WORK by the CONTRACTOR until such time as such superintendent is again present at the Site.

6.3 LABOR, MATERIALS, AND EQUIPMENT

- A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any required temporary works. The CONTRACTOR shall at all times maintain good discipline and order at the Site. Except in connection with the safety or protection of persons or the WORK or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all work at the Site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, any HCID No. 1 observed holiday, or any federally observed holiday without the OWNER's written consent. The CONTRACTOR shall apply for this consent through the ENGINEER in writing a minimum of 48 hours in advance.
- B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or 40 hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing.
- C. All increased costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The OWNER has the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.
- D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, lubricants, power, light, heat, telephone, water, sanitary facilities, and all other facilities, consumables, and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.
- E. All materials and equipment incorporated into the WORK shall be of specified quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the OWNER. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to

assign to the OWNER, ENGINEER, or any of their consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

6.4 SCHEDULE

- A. The CONTRACTOR shall comply with the schedule requirements in the General Requirements.

6.5 SUBSTITUTES OR "OR EQUAL" ITEMS

- A. The CONTRACTOR shall submit proposed substitutes or "or equal" items in accordance with the provisions set forth in the Supplemental General Provisions SGC-6.5.

6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- A. The CONTRACTOR shall be responsible to the OWNER and the ENGINEER for the acts and omissions of its Subcontractors, Suppliers, and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any Subcontractor and the OWNER or the ENGINEER nor relieve the CONTRACTOR of any liability or obligation under the Contract Documents. The CONTRACTOR shall include these General Conditions and the Supplementary General Conditions as a part of all its subcontract and supply agreements.

6.7 PERMITS

- A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements shall not be made the basis for claims for additional compensation by CONTRACTOR. When necessary, the OWNER will assist the CONTRACTOR, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids. The CONTRACTOR shall pay all charges of utility owners for inspection or connections to the WORK.

6.8 PATENT FEES AND ROYALTIES

- A. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to

the actual knowledge of the OWNER or the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed by the OWNER in the Contract Documents. The CONTRACTOR's indemnification obligation under this Paragraph 6.7 A. for all claims and liabilities arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product, or device not specified in the Contract Documents shall be in accordance with Paragraph 6.16 of these General Conditions.

6.9 LAWS AND REGULATIONS

- A. The CONTRACTOR shall observe and comply with all Laws and Regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any discrepancy or inconsistency should be discovered between the Contract Documents and any such Laws or Regulations, the CONTRACTOR shall report the same in writing to the ENGINEER. Any particular Law or Regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations. The CONTRACTOR's indemnification obligations for all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors or Suppliers shall be in accordance with Paragraph 6.17 of these General Conditions.

6.10 TAXES

- A. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the laws and regulations of the place of the Project which are applicable during the performance of the WORK.

6.11 USE OF PREMISES

- A. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site, the land and areas identified in and permitted by the Contract Documents, and the other land and areas permitted by Laws and Regulations, rights-of-way, permits, and easements. The CONTRACTOR shall assume full liability and responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the OWNER or the ENGINEER by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation at the CONTRACTOR's sole liability expense. The CONTRACTOR's indemnification obligations for all claims and liability, arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each and

any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK shall be in accordance with Paragraph 6.17 of these General Conditions.

6.12 SAFETY AND PROTECTION

- A. The CONTRACTOR shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. All persons at the Site and other persons and organizations who may be affected thereby;
 2. All the WORK and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of the performance of the WORK.
- B. The CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. CONTRACTOR'S duties and responsibilities for safety and for protection of the WORK shall continue until such time as all the WORK is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with Paragraph 14.7 B. that the WORK is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- C. The CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be made available at the Site by the CONTRACTOR for every hazardous product used.
- E. Material usage shall strictly conform to OSHA safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.
- F. The CONTRACTOR shall be responsible for the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

- G. The CONTRACTOR shall notify the ENGINEER if it considers a specified product or its intended use to be unsafe. This notification must be given to the ENGINEER prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.

6.13 EMERGENCIES

- A. In emergencies affecting the safety or protection of persons or the WORK or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or ENGINEER, is obligated to immediately act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the WORK or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Change Order will be issued to document the consequences of such action.

6.14 SUBMITTALS

- A. After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the ENGINEER for review all Shop Drawings.
- B. The ENGINEER'S review will be only to determine if the items covered by the submittals will, after installation or incorporation in the WORK, generally conform to the Contract Documents and with the design concept of the completed Project.
- C. The CONTRACTOR shall also submit to the ENGINEER for review all Samples in accordance with the accepted schedule of Sample submittals.
- D. Before submittal of each Shop Drawing or Sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the WORK and the Contract Documents. The CONTRACTOR shall provide submittals in accordance with the requirements of Submittal Requirements.

6.15 CONTINUING THE WORK

- A. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the OWNER. No WORK shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the OWNER may otherwise agree in writing.

6.16 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

- A. CONTRACTOR warrants and guarantees that all WORK will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:
1. Abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, or Suppliers, or any other individual or entity for whom CONTRACTOR is responsible;
 2. Normal wear and tear under normal usage.
- B. CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of WORK that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents:
1. Observations by ENGINEER;
 2. Recommendation by ENGINEER or payment by OWNER of any progress or final payment;
 3. The issuance of a Certificate of Completion by the OWNER;
 4. Use or occupancy of the WORK or any part thereof by the OWNER;
 5. Any acceptance by OWNER or any failure to do so;
 6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice or acceptability by ENGINEER pursuant to Paragraph 14.7 B.;
 7. Any inspection, test, or approval by others; or
 8. Any correction of Defective Work by OWNER.

6.17 INDEMNIFICATION

- A. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees, and agents of each and any of them, against and from all claims and liability arising under, by reason of, related, or incidental to the Contract Documents or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER and/or the ENGINEER. Such indemnification by the CONTRACTOR shall include, but not be limited to, the following:
1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, or agents;
 2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's, Subcontractor's, or Supplier's

- own employees, or agents engaged in the WORK resulting in actions brought by or on behalf of such employees against the OWNER and/or the ENGINEER;
3. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the CONTRACTOR, its employees, or agents;
 4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specifically stipulated in this Agreement;
 5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the OWNER and/or ENGINEER or any other parties by the CONTRACTOR, its employees, or agents;
 6. Liability or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR, its employees, or agents;
 7. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the CONTRACTOR;
 8. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the CONTRACTOR, Subcontractors, Suppliers, or any of their employees or agents, and;
 9. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each or any of them, to the extent caused by the CONTRACTOR's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or areas contiguous thereto or its performance of the WORK thereon.
- B. The CONTRACTOR shall reimburse the OWNER and the ENGINEER for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs including all costs of appeals) incurred by said OWNER and ENGINEER in enforcing the provisions of this Paragraph 6.17.
- C. The indemnification obligation under this Paragraph 6.17 shall not be limited in any way by any limitation on the amount or type of insurance carried by CONTRACTOR or by the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.

6.18 CONTRACTOR'S DAILY REPORTS

- A. The CONTRACTOR shall complete a daily report indicating location worked, total manpower for each construction trade, major equipment on Site, each Subcontractor's manpower and equipment, weather conditions, and other related information involved in the performance of the WORK. The daily report shall be completed on forms furnished by the ENGINEER, and shall be submitted to the ENGINEER at the conclusion of each workday. The daily report shall comment on the daily progress and status of each major component of the WORK. These components will be decided by the ENGINEER.

ARTICLE 7 -- OTHER WORK

7.1 RELATED WORK AT SITE

- A. The OWNER may perform other work related to the Project at the Site by the OWNER's own forces, have other work performed by utility owners, or let other direct contracts for such other work. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.
- B. The CONTRACTOR shall afford each person who is performing the other work (including the OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the WORK with theirs. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected.
- C. If the proper execution or results of any part of the CONTRACTOR's work depends upon such other work by another, the CONTRACTOR shall inspect and report to the ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work except for latent or nonapparent defects and deficiencies in the other work.

7.2 COORDINATION

- A. If the OWNER contracts with others for the performance of other work at the Site, OWNER will have sole authority and responsibility in respect of such coordination unless otherwise provided in the Supplementary General Conditions.

ARTICLE 8 -- OWNER'S RESPONSIBILITIES

8.1 COMMUNICATIONS

- A. Except as may be otherwise provided in these General Conditions or the Supplementary General Conditions, the OWNER will issue all its communications to the CONTRACTOR through the ENGINEER.

8.2 PAYMENTS

- A. The OWNER will make payments to the CONTRACTOR as provided in Article 14.

8.3 LANDS, EASEMENTS, AND SURVEYS

- A. The OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.6.

8.4 REPORTS AND DRAWINGS

- A. The OWNER will identify and make available to the CONTRACTOR copies of reports of physical conditions at the Site and drawings of existing structures which have been utilized in preparing the Contract Documents as set forth in Paragraph 4.2.

8.5 CHANGE ORDERS

- A. The OWNER will execute Change Orders as indicated in Article 10.

8.6 INSPECTIONS AND TESTS

- A. The OWNER's responsibility for inspections and tests is set forth in Paragraph 13.3.

8.7 SUSPENSION OF WORK

- A. The OWNER's right to stop work or suspend work is set forth in Paragraphs 13.4 and 15.1.

8.8 TERMINATION OF AGREEMENT

- A. The OWNER's right to terminate services of the CONTRACTOR is set forth in Paragraphs 15.2 and 15.3.

8.9 LIMITATION ON OWNER'S RESPONSIBILITIES

- A. The OWNER shall not supervise, direct or have control or authority over, nor be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the WORK. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the WORK in accordance with the Contract Documents.

8.10 UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS

- A. OWNER's responsibility in respect to an undisclosed hazardous environmental condition is set forth in Paragraph 4.5.

ARTICLE 9 -- ENGINEER'S STATUS DURING CONSTRUCTION

9.1 OWNER'S REPRESENTATIVE

- A. The ENGINEER will be the OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of the ENGINEER as the OWNER's representative during construction are set forth in the Contract Documents.

9.2 OBSERVATIONS ON THE SITE

- A. The ENGINEER will make observations on the Site during construction to monitor the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. The ENGINEER will not be required to make exhaustive or continuous inspections to check the quality or quantity of the WORK.

9.3 PROJECT REPRESENTATION

- A. The ENGINEER may furnish a Resident Project Representative to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority of any such Resident Project Representative will be as provided in the Supplementary General Conditions.

9.4 CLARIFICATIONS

- A. The ENGINEER will issue with reasonable promptness such written Clarifications of the requirements of the Contract Documents as the ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.5 AUTHORIZED VARIATIONS IN WORK

- A. The ENGINEER may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the Contract Times. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Times, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

9.6 REJECTING DEFECTIVE WORK

- A. The ENGINEER will have authority to reject Defective Work and will also have authority to require special inspection or testing of the WORK as provided in Article 13.

9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

- A. In accordance with the procedures set forth in the General Requirements, the ENGINEER will review all CONTRACTOR submittals.
- B. The ENGINEER's responsibilities for Change Orders are set forth in Articles 10, 11, and 12.
- C. The ENGINEER's responsibilities for Applications for Payment are set forth in Article 14.

9.8 DECISIONS ON DISPUTES

- A. The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK and interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK shall be determined by the ENGINEER. Any claims in respect to changes in the Contract Price or Contract Times shall be resolved in accordance with the requirements set forth in Articles 10, 11, and 12.
- B. Dispute Resolution Methods and Procedures
 - a. Either Owner or Contractor may request mediation of any Claim submitted to the Engineer for a decision under paragraph 9.8(A) before such decision becomes final and binding. **The non-binding mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association.** The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract.
 - b. Owner and Contractor shall participate in the mediation process in good faith. **The mediator shall be agreed upon by both parties, subject to North Alamo Water Supply Corporation's Board of Directors approval.** The process shall be concluded within 60 days of filing the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
 - c. If the Claim is not resolved by mediation, Engineer's action under Paragraph 9.8(A), within 30 days after termination of the mediation, Owner or Contractor may:
 - i. Elect in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - ii. Agree with the other party to submit the Claim to another dispute resolution process; or
 - iii. Give written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

9.9 LIMITATION ON ENGINEER'S RESPONSIBILITIES

- A. Neither the ENGINEER's authority to act under this Article 9 or other provisions of the Contract Documents nor any decision made by the ENGINEER in good faith either to

exercise or not exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.

- B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the ENGINEER as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.
- C. The ENGINEER will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the performance of the WORK. The ENGINEER will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, Supplier, or any other person or organization performing any of the WORK.

ARTICLE 10-- CHANGES IN THE WORK

10.1 GENERAL

- A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK. Such additions, deletions or revisions will be authorized by a Change Order or Field Order. Upon receipt of any such document, CONTRACTOR shall promptly proceed to implement the additions, deletions, or revisions in the WORK in accordance with the applicable conditions of the Contract Documents.
- B. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3.F and G.
- C. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:

1. Changes in the WORK which are ordered by the OWNER pursuant to Paragraph 10.1 A.;
 2. Changes required because of acceptance of Defective Work under Paragraph 13.6; and
 3. Changes in the Contract Price or Contract Times which are agreed to by the parties under Articles 11 and/or 12, respectively.
- D. If notice of any change in the WORK is required to be given to a surety, the giving of any such notice shall be the CONTRACTOR's responsibility. If the change in the WORK affects the Contract Price, the OWNER may require an adjustment to the amount of any applicable Bond and the amount of each applicable Bond shall be adjusted accordingly.
- E. If the OWNER and CONTRACTOR agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the WORK pending the issuance of a Change Order.
- F. If the OWNER and the CONTRACTOR are unable to agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the ENGINEER can direct the CONTRACTOR to proceed on the basis of time and materials so as to minimize the impact on and delays to the WORK, and the CONTRACTOR may make a claim as provided in Articles 11 and 12.

10.2 ALLOWABLE QUANTITY VARIATIONS

- A. In the event of an increase or decrease in the quantity of any bid item under a unit price contract, the total amount of work actually done or materials or equipment furnished will be paid for according to the unit price established for such work under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25 percent of the estimated quantity of any unit price bid item of the WORK.
- B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated work, the price of the eliminated work shall be agreed upon by the OWNER and the CONTRACTOR by Change Order.

ARTICLE 11 -- CHANGE OF CONTRACT PRICE

11.1 GENERAL

- A. The Contract Price constitutes the total compensation payable to the CONTRACTOR for performing the WORK. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.

- B. The Contract Price may only be changed by a Change Order. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:
1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
 2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4; or
 3. On the basis of the cost of work (determined as provided in Paragraph 11.3) plus the CONTRACTOR's overhead and profit (determined as provided in Paragraph 11.4).
- C. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and shall state the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 60 days after the start of such event (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of such event. All claims for adjustment in the Contract Price will be determined by the ENGINEER. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1 C.

11.2 COSTS RELATING TO WEATHER

- A. The CONTRACTOR shall have no claims against the OWNER for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the ENGINEER, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment, and work, the CONTRACTOR may be granted a reasonable extension of Contract Times to make proper repairs, renewals, and replacements of the work, materials, or equipment.

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

- A. General: The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5.
- B. Labor: The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, workers compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs

resulting from federal, state or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Nondirect labor costs including superintendence shall be considered part of the markup set out in Paragraph 11.4.

C. Materials: The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the Site in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:

1. All trade discounts and rebates shall accrue to the OWNER, and the CONTRACTOR shall make provisions so that they may be obtained;
2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Except for actual costs incurred in the handling of such materials, markup will not be allowed;
3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the Site, whichever price is lower; and
4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the Site less trade discount. The OWNER reserves the right to furnish materials for the extra work and no claim will be allowed by the CONTRACTOR for costs and profit on such materials.

D. Equipment: The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the Supplementary General Conditions. Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the OWNER for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the publication specified in the Supplementary General Conditions, an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the establishment of the rental rate. Payment for equipment shall be subject to the following:

1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used;
2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number;

3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer;
 4. Individual pieces of equipment or tools having a replacement value of \$500 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore.
- E. Equipment Rental Time: The rental time to be paid for equipment on the Site will be the time the equipment is in productive operation on the extra work being performed and, in addition, will include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the Site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the extra work on other than the extra work. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the work Site will be computed subject to the following:
1. When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be half-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation;
 2. When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs 3, 4, and 5, following;
 3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3 D., herein;
 4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the Site, or in the absence of such labor, established by collective bargaining agreements for the type of workmen and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein in accordance with the provisions of Paragraph 11.3 B., herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages; and
 5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.
- F. Special Services: Special work or services are defined as that work characterized by extraordinary complexity, sophistication, innovation, or a combination of the foregoing

attributes which are unique to the construction industry. The ENGINEER will make estimates for payment for special services and may consider the following:

1. When the ENGINEER and the CONTRACTOR, determine that a special service or work is required which cannot be performed by the forces of the CONTRACTOR or those of any of its Subcontractors, the special service or work may be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ENGINEER, invoices for special services or work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs;
2. When the CONTRACTOR is required to perform work necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the Site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as a special service and accordingly, the invoices for the work may be accepted without detailed itemization; and
3. All invoices for special services will be adjusted by deducting all trade discounts. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 15 percent will be added to invoices for special services.

G. Sureties: All work performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to Bonds or supplemental Bonds shall be submitted to the OWNER for review prior to the performance of any work hereunder.

11.4 CONTRACTOR'S OVERHEAD AND PROFIT

A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. The allowance for overhead and profit will include full compensation for superintendence, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

Overhead and Profit Allowance	
Labor	10 percent
Materials	10 percent
Equipment	10 percent

To the sum of the costs and markups provided for in this Article, an additional 2 percent of the sum will be added as compensation for Bonds and insurance.

B. It is understood that labor, materials, and equipment for extra work may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all

or any part of the extra work is performed by a Subcontractor, the allowance specified herein will be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add 5 percent of the Subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of Subcontractors, the 5 percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only .

11.5 EXCLUDED COSTS

A. The term "cost of the work" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, proprietors, partners, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the WORK all of which are to be considered administrative costs covered by the CONTRACTOR's allowance for overhead and profit;
2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site;
3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the WORK and charges against CONTRACTOR for delinquent payments;
4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except as provided by Paragraph 11.4 above);
5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property; and
6. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in Paragraph 11.4.

11.6 CONTRACTOR'S EXTRA WORK REPORT

A. In order to be paid for extra work, the CONTRACTOR must submit a daily extra work report on the form furnished by the ENGINEER. The form must be completely filled out based on the provisions of Paragraphs 11.3 through 11.5 and signed by the CONTRACTOR and ENGINEER at the end of each work day. Failure to complete the form and obtain appropriate signatures by the next working day after the extra work of the previous day was completed will result in CONTRACTOR's costs for extra work being disallowed.

ARTICLE 12-- CHANGE OF CONTRACT TIMES

12.1 GENERAL

- A. The Contract Times may only be changed by a Change Order. Any claim for an extension of the Contract Times shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 30 days after the start of such event (unless the ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR is entitled as a result of said event. All claims for adjustment in the Contract Times will be determined by the ENGINEER. No claim for an adjustment in the Contract Times will be valid if not submitted in accordance with the requirements of this Paragraph 12.1 A. An increase in Contract Times does not mean that the CONTRACTOR is due an increase in Contract Price. Only compensable time extensions will result in an increase in Contract Price.
- B. All time limits stated in the Contract Documents are of the essence of the Agreement.
- C. When CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the WORK due to such delay, if a claim is made therefor as provided in Paragraph 12.1.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER; acts or neglect of those performing other work as contemplated by Article 7; and fires, floods, epidemics, abnormal weather conditions, or acts of God. Delays attributable to and within the control of any Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.
- D. In no event will OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for any increase in the Contract Price or other damages arising out or resulting from the following:
 - 1. Delays caused by or within the control of CONTRACTOR; or
 - 2. Delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by those performing other work as contemplated by Article 7.

12.2 EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER

- A. The CONTRACTOR's construction schedule shall anticipate delay due to unusually severe weather.
- B. Contract Times may be extended by the ENGINEER because of delays in excess of the anticipated delay. The CONTRACTOR shall, within 10 days of the beginning of any such delay, notify the ENGINEER in writing and request an extension of Contract Times.

The ENGINEER will ascertain the facts and the extent of the delay and extend the Contract Times when, in its judgement, the findings of the fact justify such an extension.

ARTICLE 13 -- INSPECTIONS AND TESTS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

13.1 NOTICE OF DEFECTIVE WORK

- A. Prompt notice of Defective Work known to the OWNER or ENGINEER will be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13. Defective Work may be rejected even if approved by prior inspection.

13.2 ACCESS TO WORK

- A. OWNER, ENGINEER, their consultants, subconsultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests shall have access to the WORK at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.3 INSPECTIONS AND TESTS

- A. The CONTRACTOR shall give the ENGINEER not less than 24 hours notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. The OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. For inspection, tests, or approvals covered by Paragraphs 13.3C. and 13.3D. below;
 - 2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.3G. shall be paid as provided in said Paragraph 13.3G.; and
 - 3. As otherwise provided in the Contract Documents.
- C. If Laws and Regulations of any public body having jurisdiction require any WORK (or any part thereof) to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals; pay all costs in connection therewith; and furnish the ENGINEER the required certificates of inspection or approval.
- D. The CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the ENGINEER's acceptance of materials or equipment to be incorporated in the WORK or acceptance of materials, mix designs, or equipment submitted for approval prior to the

CONTRACTOR's purchase thereof for incorporation in the WORK. Such inspections, tests, or approvals shall be performed by organizations acceptable to the ENGINEER.

- E. The ENGINEER will make, or have made, such inspections and tests as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in the Supplementary General Conditions, the cost of such inspection and testing will be borne by the OWNER. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent reinspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.
- F. If any WORK (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ENGINEER not less than 24 hours notice of the CONTRACTOR's intention to perform such test or to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.
- G. If any WORK is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and recovered at the CONTRACTOR's expense.
- H. If the ENGINEER considers it necessary or advisable that covered WORK be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such work is Defective Work, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to, fees and charges of engineers, architects, attorneys, and other professionals. However, if such work is not found to be Defective Work, the CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

13.4 OWNER MAY STOP THE WORK

- A. If Defective Work is identified, the OWNER may order the CONTRACTOR to stop performance of the WORK, or any portion thereof, until the cause for such order has

been eliminated; however, this right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.

13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK

- A. If required by the ENGINEER, the CONTRACTOR shall promptly either correct all Defective Work, whether or not fabricated, installed, or completed, or, if the work has been rejected by the ENGINEER, remove it from the Site and replace it with non-defective WORK. The CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such correction or removal, including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby.

13.6 ACCEPTANCE OF DEFECTIVE WORK

- A. If, instead of requiring correction or removal and replacement of Defective Work, the OWNER prefers to accept the Defective Work, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept such Defective Work. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to an appropriate decrease in the Contract Price.

13.7 OWNER MAY CORRECT DEFECTIVE WORK

- A. If the CONTRACTOR fails within a reasonable time after written notice from the ENGINEER to correct Defective Work, or to remove and replace Defective Work as required by the ENGINEER in accordance with Paragraph 13.5A., or if the CONTRACTOR fails to perform the WORK in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the OWNER may, after seven days written notice to the CONTRACTOR, correct and remedy any such deficiency.
- B. In exercising the rights and remedies under this paragraph, the OWNER shall proceed with corrective and remedial action. In connection with such corrective and remedial action, the OWNER may exclude the CONTRACTOR from all or part of the Site, take possession of all or part of the WORK, and suspend the CONTRACTOR's services related thereto and incorporate in the WORK all materials and equipment for which the OWNER has paid the CONTRACTOR whether stored at the Site or elsewhere. The CONTRACTOR shall provide the OWNER, OWNER's representatives, ENGINEER, and ENGINEER's consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.
- C. All direct, indirect, and consequential costs and damages incurred by the OWNER in exercising the rights and remedies under this paragraph will be charged against the CONTRACTOR and a Change Order will be issued incorporating the necessary revisions

in the Contract Documents with respect to the WORK; and the OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, the OWNER may make a claim therefor as provided in Article 11. Such claim will include, but not be limited to, all costs of repair or replacement of work of others, destroyed or damaged by correction, removal, or replacement of CONTRACTOR's Defective Work and all direct, indirect, and consequential damages associated therewith.

- D. The CONTRACTOR shall not be allowed an extension of Contract Times (or Milestones) because of any delay in the performance of the WORK attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph.

13.8 CORRECTION PERIOD

- A. The correction period for Defective Work shall be the longer of:
 - 1. One year after the date of final acceptance;
 - 2. Such time as may be prescribed by Laws and Regulations;
 - 3. Such time as specified by the terms of any applicable special guarantee required by the Contract Documents; or
 - 4. Such time as specified by any specific provision of the Contract Documents.
- B. If, during the correction period as defined in Paragraph 13.8A above, any work is found to be Defective Work, the OWNER shall have the same remedies as set forth in Paragraphs 13.5, 13.6, and 13.7 above.
- C. Where Defective Work (and damage to other work resulting therefrom) has been corrected, removed, or replaced under this paragraph, the correction period hereunder with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

ARTICLE 14-- PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN)

- A. The schedule of values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and shall be incorporated into a form of Application for Payment acceptable to the ENGINEER.

14.2 UNIT PRICE BID SCHEDULE

- A. Progress payments on account of unit price work will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

- A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review, the Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents.
- B. The Application for Payment shall identify, as a subtotal, the amount of the CONTRACTOR total earnings to date; plus the value of materials stored at the Site which have not yet been incorporated in the WORK; and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for materials stored at the Site, but not yet incorporated in the WORK.
- C. The net payment due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the amount of retainage specified in the Supplementary General Conditions and the total amount of all previous payments made to the CONTRACTOR.
- D. The value of materials stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in the Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the Site or at another location agreed to in writing; provided, each such individual item has a value of more than \$5,000 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER.

14.4 CONTRACTOR'S WARRANTY OF TITLE

- A. The CONTRACTOR warrants and guarantees that title to all WORK, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the OWNER no later than the time of payment, free and clear of all Liens.

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

- A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the application to the OWNER, or return the application to the CONTRACTOR indicating in writing the ENGINEER's reasons for refusing to recommend payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the application. If the ENGINEER still disagrees with a portion of the application, it will submit the application recommending the undisputed portion of the application to the OWNER for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days

after presentation of the Application for Payment with the ENGINEER's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B.) become due and when due will be paid by the OWNER to the CONTRACTOR.

- B. The ENGINEER, in its discretion, may refuse to recommend the whole or any part of any payment. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:
1. The work is Defective Work or the completed WORK has been damaged requiring correction or replacement.
 2. The Contract Price has been reduced by written amendment or Change Order.
 3. The OWNER has been required to correct Defective Work or complete WORK in accordance with Paragraph 13.7.
 4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.1 through 15.4 inclusive.
- C. The OWNER may refuse to make payment of the full amount recommended by the ENGINEER because:
1. Claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the WORK.
 2. Liens have been filed in connection with the WORK, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens.
 3. There are other items entitling OWNER to a set-off against the amount recommended, or
 4. OWNER has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.5B. through 14.5C and 15.1 through 15.4 inclusive. The OWNER must give the CONTRACTOR immediate written notice (with a copy to the ENGINEER) stating the reasons for such action and promptly pay the CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

14.6 SUBSTANTIAL COMPLETION

- A. When the CONTRACTOR considers the WORK ready for its intended use, the CONTRACTOR shall notify the OWNER and the ENGINEER in writing that the WORK is substantially complete. The CONTRACTOR shall attach to this request a list of all work items that remain to be completed and a request that the ENGINEER prepare a Notice of Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER does not consider the WORK substantially complete, or the list of remaining work items to be comprehensive, the ENGINEER will notify the CONTRACTOR in writing giving the reasons therefor. If the

ENGINEER considers the WORK substantially complete, the ENGINEER will prepare and deliver to the OWNER for its execution and recordation the Notice of Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of Substantial Completion.

14.7 PARTIAL UTILIZATION

- A. The OWNER shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the OWNER plans to exercise said right, the CONTRACTOR will be notified in writing by the OWNER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.
- B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of Partial Utilization, the OWNER will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.
- C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER, and the CONTRACTOR's one year correction period shall commence only after the date of Substantial Completion for the WORK.

14.8 FINAL APPLICATION FOR PAYMENT

- A. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.6 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in the General Requirements), and other documents, all as required by the Contract Documents, and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the OWNER) of all Liens arising out of or filed in connection with the WORK.

14.9 FINAL PAYMENT AND ACCEPTANCE

- A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will, within 14 days after receipt of the final Application for Payment, indicate in writing

the ENGINEER's recommendation of payment and present the application to the OWNER for payment.

- B. After acceptance of the WORK by the OWNER's governing body, the OWNER will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:
 - 1. Liquidated damages, as applicable;
 - 2. Amounts withheld by OWNER under Paragraph 14.5B. and C. which have not been released; and
 - 3. Two times the value of outstanding items of correction work or punch list items yet uncompleted or uncorrected, as applicable. All such work shall be completed or corrected to the satisfaction of the OWNER within the time stated on the Notice of Completion, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the OWNER to cover the value of all such uncompleted or uncorrected items.
- C. As a condition of final payment, the CONTRACTOR shall be required to execute a release on the form provided by OWNER, releasing the OWNER from any and all claims of liability for payment on the Project except for such amounts as may be specifically described and excluded from the release.

14.10 RELEASE OF RETAINAGE AND OTHER DEDUCTIONS

- A. After executing the necessary documents to initiate the Lien period, and not more than 45 days thereafter (based on a 30-day Lien filing period and 15-day processing time), the OWNER will release to the CONTRACTOR the retainage funds withheld pursuant to the Agreement, less any deductions to cover pending claims against the OWNER pursuant to Paragraph 14.5C.
- B. After filing of the necessary documents to initiate the Lien period, the CONTRACTOR shall have 30 days to complete any outstanding items of correction work remaining to be completed or corrected as listed on a final punch list made a part of the Notice of Completion. Upon expiration of the 45 days, referred to in Paragraph 14.10A., the amounts withheld pursuant to the provisions of Paragraph 14.9B. herein, for all remaining work items will be returned to the CONTRACTOR; provided, that said work has been completed or corrected to the satisfaction of the OWNER within said 30 days. Otherwise, the CONTRACTOR does hereby waive any and all claims for all monies withheld by the OWNER under this Agreement to cover two times the value of such remaining uncompleted or uncorrected items.

ARTICLE 15 -- SUSPENSION OF WORK AND TERMINATION

15.1 SUSPENSION OF WORK BY OWNER

- A. The OWNER may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR without claim by CONTRACTOR for additional compensation. Beyond the ninety (90) day period, the CONTRACTOR shall resume the WORK on receipt of a notice of resumption of work. The CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefore as provided in Articles 11 and 12.

15.2 TERMINATION OF AGREEMENT BY OWNER FOR DEFAULT

- A. In the event of default by the CONTRACTOR, the OWNER may give seven days written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default within a specified period of time. It will be considered a default by the CONTRACTOR whenever CONTRACTOR shall:
 - 1. Declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors;
 - 2. Disregard or violate the Laws or Regulations of any public body having jurisdiction;
 - 3. Fail to provide materials or workmanship meeting the requirements of the Contract Documents;
 - 4. Disregard or violate provisions of the Contract Documents or ENGINEER's instructions;
 - 5. Fail to prosecute the WORK according to the approved progress schedule;
 - 6. Fail to provide a qualified superintendent, competent workmen, or materials or equipment meeting the requirements of the Contract Documents; or
 - 7. Disregard the authority of the ENGINEER.
- B. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue the notice of termination.
- C. In the event the Agreement is terminated in accordance with Paragraph 15.2A., herein, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK will be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

15.3 TERMINATION OF AGREEMENT BY OWNER FOR CONVENIENCE

- A. Upon seven days' written notice to the CONTRACTOR and the ENGINEER, the OWNER may, without cause and without prejudice to any other right or remedy of the

OWNER, elect to terminate the Agreement. In such case, the CONTRACTOR shall be paid (without duplication of any items):

1. For completed and acceptable WORK executed in accordance with the Contract Documents, prior to the effective date of termination, including fair and reasonable sums for overhead and profit of such WORK;
2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted WORK, plus fair and reasonable sums for overhead and profit on such expenses;
3. For all reasonable claims, costs, losses, and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
4. For reasonable expenses directly attributable to termination, CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.4 TERMINATION OF AGREEMENT BY CONTRACTOR

- A. The CONTRACTOR may terminate the Agreement upon 14 days written notice to the OWNER, whenever:
 1. The WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the Agreement has not been received from the OWNER within this time period; or
 2. The OWNER should fail to pay the CONTRACTOR any monies due him in accordance with the terms of the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of a request therefor, unless within said 14-day period the OWNER shall have remedied the condition upon which the payment delay was based.
- B. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

ARTICLE 16 -- MISCELLANEOUS

16.1 GIVING NOTICE

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 TITLE TO MATERIALS FOUND ON THE WORK

- A. The OWNER reserves the right to retain title to all soils, stone, sand, gravel, and other materials developed and obtained from excavations and other operations connected with the WORK. Unless otherwise specified in the Contract Documents, neither the CONTRACTOR nor any Subcontractor shall have any right, title, or interest in or to any such materials. The CONTRACTOR will be permitted to use in the WORK, without charge, any such materials which meet the requirements of the Contract Documents.

16.3 RIGHT TO AUDIT

- A. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discover and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plant, or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the OWNER.

16.4 SURVIVAL OF OBLIGATIONS

- A. All representations, indemnifications, warranties, and guaranties made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the WORK or termination or completion of the Agreement.

16.5 CONTROLLING LAW

- A. This Agreement is to be governed by the law of the state in which the Project is located.

16.6 SEVERABILITY

- A. If any term or provision of this Agreement is declared invalid or unenforceable by any court of lawful jurisdiction, the remaining terms and provisions of the Agreement shall not be affected thereby and shall remain in full force and effect.

16.7 WAIVER

- A. The waiver by the OWNER of any breach or violation of any term, covenant or condition of this Agreement or of any provision, ordinance, or law shall not be deemed to be a waiver of any other term, covenant, condition, ordinance, or law or of any subsequent breach or violation of the same or of any other term, covenant, condition, ordinance, or law. The subsequent payment of any monies or fee by the OWNER which may become due hereunder shall not be deemed to be a waiver of any preceding breach or violation by CONTRACTOR or any term, covenant, condition of this Agreement or of any applicable law or ordinance.

- END OF GENERAL CONDITIONS -

SUPPLEMENTARY GENERAL CONDITIONS

PART 1-- GENERAL

These Supplementary General Conditions make additions, deletions, or revisions to the General Conditions as indicated herein. All provisions which are not so added, deleted, or revised remain in full force and effect. Terms used in these Supplementary General Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

SGC-1 DEFINITIONS

Add the following definitions to Article 1:

ENGINEER - In accordance with its contract with the OWNER, the ENGINEER is further defined as the firm of SDI Engineering, LLC, 5602 E. Iowa Rd., Edinburg, Texas 78542.

OWNER -The OWNER is further defined as the City of Edinburg, 415 W. University Drive, Edinburg, Texas, 78539.

SGC-2.2 COPIES OF DOCUMENTS

The OWNER shall furnish to the CONTRACTOR two copies of the Contract Documents which may include bound reduced drawings, if any, together with two sets of full-scale Drawings. Additional quantities of the Contract Documents will be furnished at reproduction cost plus mailing cost if copies are mailed.

SGC-2.4 STARTING THE WORK

Add the following as Paragraphs 2.4C and 2.4D of the General Conditions:

- C. The CONTRACTOR shall notify the Texas Excavation Safety System (TESS), Phone No. 1-800-DIG-TESS, at least 48 hours in advance of the commencement of work at any site to allow the member utilities to examine the construction site and mark the location of the utilities' respective facilities.

- D. The CONTRACTOR acknowledges that some (or all) of the utility companies with facilities shown on the drawings may not be members of TESS and, therefore, not automatically contacted by the above referenced telephone number. The CONTRACTOR shall be responsible for making itself aware of utility company facilities not reported by the USA System, and shall be liable for any and all damages stemming from repair or delay costs or any other expenses resulting from the unanticipated discovery of underground utilities. The CONTRACTOR shall be responsible for notifying all of the utilities at least 48 hours in advance of the commencement of work at any site to allow the utilities to examine the construction site and mark the location of the utilities'

respective facilities. The CONTRACTOR shall also be responsible for verifying that each utility has responsibly responded to such notification.

SGC-4.2 REPORTS OF PHYSICAL CONDITIONS

In the preparation of the Contract Documents, the ENGINEER has relied upon reports of explorations and tests of subsurface conditions at the site prepared by a Geotechnical Engineer engaged for this project. The Geotechnical Engineer prepared a report for this project. A copy of this report and drawings may be examined at the office of Engineer/Architect, during regular business hours if said reports and drawings are not bound herein. The CONTRACTOR may rely upon the accuracy of the technical data contained in the geotechnical report and drawings; however, the interpretation of such technical data, including any interpolation or extrapolation thereof, and opinions contained in the report and drawings are not to be relied on by the CONTRACTOR.

SGC-4.5 HAZARDOUS MATERIALS

No reports have been made available to the ENGINEER to indicate there will be discovery of Asbestos, PCB's, Petroleum, Hazardous Wastes, and/or Radioactive Materials at the Site. If the Contractor encounters existing material on sites owned or controlled by the Owner or in material sources that are suspected by visual observation or smell to contain hazardous materials, the Contractor shall immediately notify the Engineer and the Owner. The Owner will be responsible for the testing for and removal or disposition of hazardous materials on sites owned or controlled by the Owner. The Owner may suspend the work, wholly or in part during the testing, removal or disposition of hazardous materials on sites owned or controlled by the Owner. Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in the specifications.

SGC-5.1 BONDS

Delete the first sentence of Paragraph 5.1A and add the following:

The CONTRACTOR shall furnish a satisfactory Performance Bond in the amount of 100 percent of the Contract Price and a satisfactory Payment Bond in the amount of 100 percent of the Contract Price as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents.

SGC-5.2 INSURANCE

- A. The limits of liability for the insurance required by Paragraph 5.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations. Limits may be provided by a combination of primary and excess liability policies or through a single policy. If the limits are provided by a combination of primary and excess liability policies, then the excess or umbrella liability overages shall include commercial general, comprehensive automobile, and

employer's liability and shall provide coverage at least as broad as the underlying policies.

1. Workers' Compensation:

a. State: In accordance with State Statute

b. Applicable Federal (e.g. USL&H): Statutory

Note: If the WORK called for in the Contract Documents involves work in or on any navigable waters, the CONTRACTOR shall provide Workers' Compensation coverage which shall include coverage under the Longshore and Harbor Workers' Compensation Act, the Jones Act, Maritime Law, and any other coverage required under Federal or State laws pertaining to workers in or on navigable waters.

2. Employer's Liability

Bodily Injury by Accident: \$100,000 each accident

Bodily Injury by Disease: \$100,000 each employee
\$500,000 policy limits

3. Comprehensive General Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence

Property Damage \$100,000 each occurrence
\$100,000 aggregate

-or- \$500,000 combined single limits

4. Comprehensive Auto Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence

Property Damage \$100,000 each occurrence
\$100,000 each aggregate

-or- \$500,000 combined single limits

5. City's Protective Liability

Bodily Injury \$250,000 each person
\$500,000 each occurrence

Property Damage \$100,000 each occurrence
\$100,000 each aggregate

-or- \$500,000 combined single limits

B. All policies shall provide that the CONTRACTOR agrees to waive all rights of subrogation against the OWNER, the ENGINEER, and their subconsultants, employees,

officers and directors, for WORK performed under the Agreement. Endorsements shall be provided with certificates of insurance.

- C. All policies shall also specify that the insurance provided by the CONTRACTOR will be considered primary and not contributory to any other insurance available to the OWNER or ENGINEER.
- D. All policies except Workers' Compensation and Builders Risk shall name the OWNER, ENGINEER, their consultants, subconsultants, and their officers, directors, agents and employees as additional insureds. The Builders Risk insurance shall name the CONTRACTOR, OWNER, and ENGINEER as named insureds.
- E. All policies shall provide for thirty days notice prior to any cancellation, reduction in coverage or nonrenewal.

SGC-5.2C INSURANCE

Add the following to Paragraph 5.2C of the General Conditions:

The CONTRACTOR shall also name the City of Edinburg and its officers, directors, agents, and employees as "additional insureds" under the insurance policies.

SGC-6.5 SUBSTITUTES OR "OR EQUAL" ITEMS

Add the following to Paragraph 6.5 of the General Conditions:

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
 - 1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.
 - 2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER's decision shall be final.
 - 3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.
 - 4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.
 - 5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.

6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

B. The procedure for review by the ENGINEER will include the following:

1. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request Form."
2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 35-day period after award of the Contract.
3. Wherever a proposed substitution item has not been submitted within said 35-day period, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
4. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.
5. The ENGINEER will evaluate each proposed substitution within a reasonable period of time.
6. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.

C. The CONTRACTOR's application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:

1. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.
2. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.
3. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.
4. Whether all variations of the proposed substitution from the items originally specified are identified.
5. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
6. Whether an itemized estimate is included of all costs that will result directly or indirectly from acceptance of such substitution, including cost of redesign and claims of other contractors affected by the resulting change.

7. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.

D. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution.

SGC-6.6 SUBCONTRACT LIMITATIONS

Add the following as Paragraph 6.6B of the General Conditions:

B. The CONTRACTOR shall perform not less than 20 percent of the WORK with its own forces (i.e., without subcontracting). The 20 percent requirement shall apply to the Contract Price less the values of OWNER-assigned contracts and allowances in the Bid for prenegotiated WORK.

SGC-6.7 PERMITS

A. Except for the permits specifically set forth in A above, the CONTRACTOR shall acquire all permits required by Laws or Regulations, including, without limitation, the following specific permits (if applicable):

1. Local jurisdiction building permits. OWNER will pay for local jurisdiction building permit. CONTRACTOR will be responsible for acquiring permit.
2. State permits to construct and/or operate sources of air pollution.
3. Certificates and permits are required for sources such as, but not limited to:
 - a. Fuel burning equipment
 - b. Gasoline and petroleum distillate storage containers
 - c. Land disturbing activities
 - d. Processing equipment (sand, gravel, concrete batch plant, etc.)
 - e. Odors
4. Permits to construct and/or operating permits for construction should be obtained from: United Irrigation District
5. Stormwater Permit.
6. Permit-Required Confined Space - The workplace in which the WORK is to be performed may contain permit-required confined spaces (permit spaces) as defined 29 CFR 1910.146 and, if so, permit space entry is allowed only through compliance with a confined space entry program meeting the requirements of 29 CFR 1910.146.

SGC-6.17 INDEMNIFICATION

Add the following to Paragraph 6.17A of the General Conditions:

The CONTRACTOR shall also indemnify, defend, and hold harmless the City of Edinburg, and its officers, directors, agents, and employees, against and from all claims and liability arising under or by reason of the Agreement or any performance of the WORK, but not from the sole negligence or willful misconduct of the City of Edinburg.

SGC-9.3 PROJECT REPRESENTATION

- A. The Owner, authorized representatives and agents of the Owner shall, at all times have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract. The Resident Project Representative, who is the OWNER's agent, will act as directed by and under the supervision of the OWNER and will confer with the ENGINEER regarding its actions. The Resident Project Representative's dealings in matters pertaining to the WORK shall, in general, be only with the ENGINEER and the CONTRACTOR, and dealings with Subcontractors shall only be through or with the full knowledge of the CONTRACTOR. Written communication with the OWNER will be only through or as directed by the ENGINEER.

- B. The Resident Project Representative shall have the duties and responsibilities set forth in this paragraph.
 - 1. Review the progress schedule of Shop Drawing submittals and schedule of values prepared by the CONTRACTOR and consult with the ENGINEER concerning their acceptability.
 - 2. Attend preconstruction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with the ENGINEER and notify in advance those expected to attend. Attend meetings and maintain and circulate copies of minutes thereof.
 - 3. Serve as the ENGINEER's liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent and assist said superintendent in understanding the intent of the Contract Documents. Assist the ENGINEER in serving as the OWNER's liaison with the CONTRACTOR.
 - 4. Receive Shop Drawings and samples furnished by the CONTRACTOR.
 - 5. Conduct on-site observations of the WORK in progress to assist the ENGINEER in determining if the WORK is proceeding in accordance with the Contract Documents.
 - 6. Verify that the tests, equipment, and systems startups and operating and maintenance instruction are conducted as required by the Contract documents and in presence of the required personnel, and that the CONTRACTOR maintains adequate records thereof.
 - 7. Transmit to the CONTRACTOR the ENGINEER's clarifications and interpretations of the Contract Documents.
 - 8. Consider and evaluate the CONTRACTOR's suggestions for modifications in the Contract Documents and report them with recommendations to the ENGINEER.
 - 9. Review applications for payment with the CONTRACTOR for compliance with the established procedure for their submittal and forward them with recommendations to

the ENGINEER, noting particularly their relation to the schedule of values, work completed, and materials and equipment delivered at the Site but not incorporated in the WORK.

10. During the course of the WORK, verify that certificates, maintenance and operation manuals, and other data required to be assembled and furnished by the CONTRACTOR are applicable to the items actually installed.
11. Before the ENGINEER prepares a Notice of Completion, as applicable, submit to the CONTRACTOR a list of observed items requiring completion or correction.
12. Conduct final inspection in the company of the ENGINEER, the OWNER, and the CONTRACTOR, and prepare a punch list of items to be completed or corrected.
13. Verify that all items on the punch list have been completed or corrected and make recommendations to the ENGINEER concerning acceptance.

SGC-11.3D EQUIPMENT

The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current edition of the following reference publication:

- A. "Rental Rate Blue Book for Construction Machinery" as published by the Machinery Information Division of the K-III Directory Corporation, (800) 669-3282.

SGC-12.2 WEATHER DELAYS

Delete paragraphs 12.2.A and 12.2.B. Add the following:

- A. The occurrence of unusually severe weather during the life of the Contract will be considered a basis for extending contract time when work is not already suspended for other reasons. Unusually severe weather means weather, which at the time of year that it occurs, is unusual for the place in which it occurs.
- B. Extension of time for unusually severe weather will be determined on a monthly basis and will include only those actual adverse weather days in excess of the normal adverse weather days included in the Contract Time. Normal adverse weather means adverse weather which, regardless of its severity, is to be reasonable expected for that particular place at that particular time of year. The normal adverse weather days included in the Contract Time are based on historical records of temperature and precipitation.
- C. Actual adverse weather days are those days meeting one or more of the criteria listed below. Time extensions for more than one criterion will take into consideration only that criterion having the greatest impact. Those actual adverse weather days in excess of the days listed in Table 12-1 will be allowed without regard to when they occur (except prior to mobilization or during suspension for other reasons) or their impact on contract completion.
 1. Days with maximum temperature of 32 degrees F or less – one full day allowed.

2. Days with minimum temperature of 32 degrees F or less, but whose maximum temperature is over 32 degrees F – one-half day allowed.
3. Days when 1/2" or more of precipitation (rain or snow equivalent) occurs – one full day allowed.

D. Attached to the monthly Extension of Time Request, the CONTRACTOR shall submit a summary statement showing the number of days charged to the Contract for the preceding period

1. An itemized account of each day of the month showing which days meet one of the criteria outlined above.
3. A total number of adverse weather days.
4. The total number of days due to the CONTRACTOR for adverse weather days in excess of the normal adverse weather days.

SGC-14.3C AMOUNT OF RETENTION

Add the following to Paragraph 14.3C of the General Conditions:

Unless otherwise prescribed by law, the OWNER may retain a portion of the amount otherwise due to the CONTRACTOR, as follows:

1. Contracts equaling a total amount of \$400,000.00 or over will bear a retainage of five (5) percent (%) on each partial disbursement. Contracts totaling less than \$400,000.00 will bear a retainage of ten (10) percent (%) on each partial disbursement.

SGC-14.3D VALUE OF MATERIALS STORED AT THE SITE

Unless otherwise prescribed by law, the value of materials stored at the Site shall be 90% of the value of such materials.

SGC-16.8 OPERATION AND MAINTENANCE MANUALS AND TRAINING.

- A. The Contractor shall obtain installation, operation, and maintenance manuals from manufacturers and suppliers for equipment furnished under the contract. The Contractor shall submit three copies of each complete manual to the Engineer within 90 days after approval of shop drawings, product data, and samples, and not later than the date of shipment of each item of equipment to the project site or storage location.
- B. Each manual is to be bound in a folder and labeled to identify the contents and project to which it applies. The manual shall contain the following applicable items:

1. A listing of the manufacturer's identification, including order number, model, serial number, and location of parts and service centers.
 2. A list of recommended stock of parts, including part number and quantity.
 3. Complete replacement parts list.
 4. Performance data and rating tables.
 5. Specific instructions for installation, operation, adjustment, and maintenance.
 6. Exploded view drawings for major equipment items.
 7. Lubrication requirements.
 8. Complete equipment wiring diagrams and control schematics with terminal identification.
- C. Operations and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by the Contractor to install, test, and start-up the equipment.
- D. The Owner shall require the Engineer to promptly review each manual submitted, noting necessary corrections and revisions. If the Engineer rejects the manual, the Contractor shall correct and resubmit the manual until it is acceptable to Engineer as being in conformance with design concept of project and for compliance with information given in the Contract Documents. Owner may assess Contractor a charge for reviews of same items in excess of three (3) times. Such procedure shall not be considered cause for delay. Acceptance of manuals by Engineer does not relieve Contractor of any requirements or terms of the Contract.
- E. The Contractor shall provide the services of trained, qualified technicians to check final equipment installation, to assist as required in placing same in operation, and to instruct operating personnel in the proper manner of performing routine operation and maintenance of the equipment.

SGC-16.9 AS-BUILT DIMENSION & DRAWINGS.

- A. Contractor shall make appropriate daily measurements of facilities constructed and keep accurate records of location (horizontal and vertical) of all facilities.
- B. Upon completion of each facility, the Contractor shall furnish Owner with one set of direct prints, marked with red pencil, to show as-built dimensions and locations of all work constructed. As a minimum, the final drawings shall include the following:
1. Horizontal and vertical locations of work.
 2. Changes in equipment and dimensions due to substitutions.
 3. "Nameplate" data on all installed equipment.
 4. Deletions, additions, and changes to scope of work.
 5. Any other changes made.

END OF SUPPLEMENTARY GENERAL CONDITIONS

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LEFT BLANK INTENTIONALLY

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LEFT BLANK INTENTIONALLY

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LEFT BLANK INTENTIONALLY

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SECTION 01005 DEFINITIONS AND TERMINOLOGY

PART 1 - GENERAL

1.01 SPECIFICATION TERMINOLOGY

- A. "Certified" used in context with materials and equipment means the material and equipment has been tested and found by a nationally recognized testing laboratory to meet specification requirements, or nationally recognized standards if requirements are not specified, and is safe for use in the specified manner. A nationally recognized testing laboratory must periodically inspect production of the equipment and the equipment must bear a label, tag, or other record of certification.
- B. "Certified" used in context with labor performance or ability to install materials and equipment means that the abilities of the proposed installer have been tested by a representative of the specified testing agency authorized to issue certificates of competency and has met the prescribed standards for certification.
- C. "Certified" used in context with test reports, payment requests or other statements of fact means that the statements made on the document are a true statement as attested to by the certifying entity.
- D. "Engineer" shall mean SDI Engineering.
- E. "Furnish" means to supply, deliver and unload materials and equipment at the project site ready to install.
- F. "Indicated" means graphic representations, notes, or schedules on drawings, or other requirements in Contract Documents. Words such as "shown", "noted", "scheduled", are used to help locate the reference. No limitation on the location is intended unless specifically noted.
- G. "Install" means the operations at the project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, training and similar operations required to prepare the materials and equipment for use, verify conformance with Contract Documents and prepare for acceptance and operation by the Owner.
- H. "Installer" means an entity engaged by Contractor, either as an employee, subcontractor, or sub-subcontractor to install materials and/or equipment. Installers are to have successfully completed a minimum of five projects similar in size and scope to this project, have a minimum of five years of experience in the installation of similar materials and equipment, and comply with the requirements of the authority having jurisdiction.

- I. "Labeled" means equipment that embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc. and production is periodically inspected in accordance with nationally recognized standards or tests to determine safe use in a specified manner.
- J. "Listed" means equipment is included in a list published by a nationally recognized laboratory which makes periodic inspection of production of such equipment and states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
- K. "Manufacturer" means an entity engaged by Contractor, as a subcontractor, or sub-subcontractor to furnish materials and/or equipment. Manufacturers are to have a minimum of five years' experience in the manufacture of materials and equipment similar in size, capacity and scope to the specified materials and equipment.
- L. "Perform" means to complete the operations necessary to comply with the Contract Documents.
- M. "Owner" means the City of Edinburg.
- N. "Project site" means the space available to perform the work, either exclusively or in conjunction with others performing construction at the project site.
- O. "Provide" means to furnish and install materials and equipment.
- P. "Regulations" means laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction, as well as, rules, conventions, and agreements within the construction industry that control performance of work, whether they are lawfully imposed by authorities having jurisdiction or not.
- Q. "Specified" means written representations in the bid documents or the technical specifications.

1.02 SPECIFICATION SENTENCE STRUCTURE

- A. Specifications are written in modified brief style. Requirements apply to all work of the same kind, class, and type even though the word "all" is not stated.
- B. Simple imperative sentence structure is used which places a verb as the first word in the sentence. It is understood that the words "furnish", "install", "provide", or similar words include the meaning of the phrase "The Contractor shall.' before these words.

- C. It is understood that the words “directed”, “designated”, requested”, ‘authorized”, “approved”, “selected’, or similar words include the meaning of the phrase “by the Engineer” after these words unless otherwise stated. Use of these words does not extend the Engineers responsibility for construction supervision or responsibilities beyond those defined in the General Conditions.
- D. “At no additional cost to Owner”, “with no extra compensation to Contractor”, “At Contractor’s own expense”, or similar words mean that the Contractor will perform or provide specified operation of work without any increase in the Contract Amount. It is understood that the cost for performing all work is included in the amount bid and will be performed at no additional cost to the Owner unless specifically stated otherwise.

1.03 DOCUMENT ORGANIZATION

- A. Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor when dividing work among subcontractors, or to establish the extent of work to be performed by any trade, subcontractor or vendor. Specification or details do not need to be indicated or specified in each specification or drawing. Items shown in the contract documents are applicable regardless of location in the Contract Documents.
- B. Standard paragraph titles and other identifications of subject matter in the specifications are intended to aid in locating and recognizing various requirements of the specifications. Titles do not define, limit, or otherwise restrict specification text.
- C. Capitalizing words in the text does not mean that these words convey special or unique meanings or have precedence over other parts of the Contract Documents. Specification text governs over titling and it is understood that the specification is to be interpreted as a whole.
- D. Drawings and specifications do not indicate or describe all of the work required to complete the project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer. Provide any work, materials or equipment required for a complete and functional system even if they are not detailed or specified.

1.04 INTERPRETATIONS OF DOCUMENTS

- A. Comply with the most stringent requirements where compliance with two (2) or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.

1. Quantity or quality level shown or indicated shall be minimum to be provided or performed in every instance.
 2. Actual installation may comply exactly with minimum quality indicated, or it may exceed that minimum within reasonable limits.
 3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
 4. Refer instances of uncertainty to the Engineer for a decision before proceeding.
- B. Provide materials and equipment comparable in quality to similar materials and equipment incorporated in the project or as required to meet the minimum requirements of the application if the materials and equipment are shown in the drawings but are not included in the specifications.

1.05 REFERENCE STANDARDS

- A. Comply with applicable construction industry standards as if bound or copied directly into the Contract Documents regardless of lack of reference in the Contract Documents. Apply provisions of the Contract, Documents where Contract Documents include more stringent requirements than the referenced standards.
1. Standards referenced directly in the Contract Documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.
 2. Comply with standards not referenced but recognized in the construction industry as applicable for performance of the work except as otherwise limited by the Contract Documents. The Engineer determines whether code or standard is applicable, or which of several are applicable.
- B. Consider a referenced standard to be the latest edition with supplements or amendments when a standard is referred to in an individual specification section but is not listed by title and date.
- C. Trade association names and title of general standards are frequently abbreviated. Acronyms or abbreviations used in the Contract Documents mean the recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable in the context of the Contract Documents.
- D. Make copies of reference standards available as requested by Engineer or Owner.

1.06 SUBSTITUTIONS AND EQUAL PRODUCTS

Provide materials and equipment manufactured by the entities specifically listed in each technical specification section. Submit a Contractors Modification Request per Section 01300, SUBMITTALS for substitution of materials and equipment of manufacturers not specifically listed or for materials and equipment that does not strictly comply with the Contract Documents. Contractor may provide “equal” products manufactured by manufacturers other than those specifically listed in the technical specification section unless it is specifically stated that only the materials and equipment of the specified manufacturers shall be provided. Provide a request for approval of proposed equals per Section 01300 SUBMITTALS for any materials or equipment not specifically listed. Submit a Contractors Modification Request for substitution of materials and equipment of other manufacturers or for materials and equipment that does not strictly comply with the Contract Documents. A Field Order or Change Order will be issued if the contract modification is approved.

END OF SECTION

SECTION 01040 PROJECT ADMINISTRATION

PART 1- GENERAL

1.01 WORK INCLUDED

- A. Administer contract requirements to construct the project. Provide documentation per the requirements of this Section. Provide information as requested by the Engineer/Architect or Owner concerning this project.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01300, SUBMITTALS.

1.03 COMMUNICATION DURING THE PROJECT

- A. The Engineer is to be the first point of contact for all parties on matters concerning this project.
- B. The Engineer will coordinate correspondence concerning:
 - 1. Submittals, including requests for payment
 - 2. Clarification and interpretation of the Contract Documents
 - 3. Contract modifications
 - 4. Observation of work and testing
 - 5. Claims
- C. The Engineer will normally communicate only with the Contractor. Any required communication with suppliers or subcontractors shall only be with the direct involvement of the Contractor.
- D. Written communications are to be directed to the Engineer at the address indicated in the Pre-construction Conference. Communications should include as a minimum:
 - 1. Name of the Owner
 - 2. Project name
 - 3. Contract title
 - 4. Project number
 - 5. Date
 - 6. A reference statement
- E. Submit communications on the forms referenced in this Section or in Section 01300. SUBMITTALS.

1.04 PROJECT MEETINGS

A. Pre-construction Conference

1. Attend a pre-construction meeting.
2. The location of the conference will be determined by the Owner.
3. The time of the meeting will be determined by the Owner but will be after the Notice of Award is issued and not later than fifteen (15) days after the Notice to Proceed is issued or can be issued at the Pre-Construction Conference.
4. Meeting will be attended by the Owner, Engineer and the Contractors project manager and superintendent. Meeting may be attended by representative of utility companies and representatives from major subcontractors and suppliers.
5. Contractor should provide and be prepared to discuss:
 - a. Preliminary construction schedule per Section 01310, PROGRESS SCHEDULE.
 - b. Preliminary Submittal Schedule.
 - c. Schedule of values and anticipated schedule of payments.
 - d. List of Suppliers and Subcontractors.
 - e. Contractor's organizational chart as it relates to this project.
 - f. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents.

B. Periodical Progress Meetings

1. Attend meetings with the Engineer and Owner.
 - a. Meet on a Monthly basis or as requested by the Engineer to discuss the project.
 - b. Meet at the project site or other location as designated by the Engineer.
 - c. Contractors superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
2. Provide information as requested by the Engineer or Owner concerning this project.
 - a. Prepare to discuss:
 - 1) Status of overall project schedule.
 - 2) Contractors detailed schedule for the next month.
 - 3) Anticipated delivery dates for equipment.
 - 4) Coordination with the Owner.
 - 5) Status of submittals.
 - 6) Information or clarification of the Contract Documents.
 - 7) Claims and proposed modifications to the contract.
 - 8) Field observations, problems, or conflicts.
 - 9) Maintenance of quality standards.

- b. Notify the Engineer of any specific items to be discussed a minimum of one (1) week prior to the meeting.
3. Review minutes of meetings and notify the Engineer of any discrepancies within ten (10) days of the date of the memorandum.
 - a. Following that date, the minutes will stand as shown or as corrected.
 - b. Corrections will be reflected in the minutes of the following meeting.
 - c. Each item of business shall be numbered to indicate the meeting number and the item number. Items discussed will be documented and old business items will remain on minutes of subsequent meetings until the item is resolved.

1.05 REQUESTS FOR INFORMATION

- A. Submit Request for Information (RFI) to the Engineer to obtain additional information or clarification of the Contract Documents.
 1. Submit a separate RFI for each item.
 2. Attach adequate information to permit a written response without further clarification. Engineer will return requests which do not have adequate information for additional information.
 3. A response will be made when adequate information is provided. Response will be made on the RFI form or in attached information.
 4. Assign a number to the RFI and sequence number in chronological order.
- B. If the RFI indicates that a contract modification is required, the Engineer will initiate a Proposed Contract Modification (PCM) per Section 1.07.

1.06 NOTIFICATION BY CONTRACTOR

- A. Notify the Engineer of:
 1. Need for testing.
 2. Intent to work outside regular working hours.
 3. Request to shut down facilities or utilities.
 4. Proposed utility connections.
 5. Required observation by Owner or inspection agencies prior to covering work.
- B. Notification must be provided in time for Owner and Engineer to respond appropriately to the notification.
- C. Use "Notification by Contractor" form. Form can be requested from Owner or Engineer.

1.07 REQUESTS FOR MODIFICATIONS

- A. Submit a request to the Engineer for any change in the Contract Documents or approval of any deviations from the Contract Documents.
 - 1. Use the "Contractors Modification Request" (CMR) form. Contractor's own form can also be submitted pending completeness of required information.
 - a. Assign a number to the CMR when issued and sequence number in chronological order.
 - b. Include with the CMR:
 - 1) A complete description of the proposed modification.
 - 2) The reason the modification is requested.
 - 3) A detailed breakdown of the cost of the change (necessary only if the modification requires a change in contract amount). The itemized breakdown is to include:
 - (a) list of materials and equipment to be installed,
 - (b) man hours for labor by classification,
 - (c) equipment used in construction,
 - (d) consumable supplies, fuels, and materials,
 - (e) royalties and patent fees,
 - (f) bonds and insurance,
 - (g) overhead and profit,
 - (h) field office costs,
 - (i) home office cost,
 - (j) and other items of cost.
 - 4) A revised schedule indicating the effect on the critical path for the project and a statement of the number of days the project may be delayed by the modification.
 - 2. A CMR is required for field changes.
 - a. Request must be made a minimum of two (2) weeks in advance of performing the work affected.
 - b. Request for field changes will be submitted to the Engineer.
 - 3. A CMR is required for all substitutes or deviations from the Contract Documents.
 - 4. Engineer will evaluate the request for a contract modification.
- B. Owner will initiate changes through the Engineer.
 - 1. Engineer will prepare a description of the proposed modifications to the Contract Documents.
 - 2. Engineer will use the "Proposed Contract Modification" form or own form. Engineer will assign a number to the PCM when issued and keep in numerical order throughout project.
 - 3. Return request with a proposal to incorporate the requested change. Include a breakdown of costs into materials and labor in sufficient detail to allow evaluation by the Engineer.
- C. If a contract modification is required, the Engineer will issue a Field Order or a Change Order.

1. Modifications to the contract can only be made by a Field Order or a Change Order.
2. Changes in the project will be documented by Field Order or by a Change Order.
3. Field Orders may be issued by the Engineer for contract modifications that do not change the contract amount or contract time.
4. Any modifications that require a change in contract amount or contract time can only be approved by Change Order.
 - a. CMR's and proposals issued by the Contractor in response to a PCM will be evaluated by the Engineer.
 - b. If change order is recommended, the Engineer will prepare the change order.
 - c. The Change Order will be sent to the Contractor for execution with a copy to the Owner recommending approval.
 - d. Change Orders can only be approved by the Owner.
 - 1) Work performed on the proposed contract modifications prior to the approval of the Change Order will be performed at the Contractor's risk.
 - 2) No payment will be made for work on Change Orders until approved by the Owner.

D. The Contractor may be informed that the proposed modification is not approved and construction is to proceed in accordance with the Contract Documents.

1.08 EMERGENCY WORK

- A. Notify the Owner and Engineer immediately of any additional work that must be performed to prevent injury or damage to existing structures, facilities, utilities, or work in place.
- B. When possible, obtain authorization from the Owner before proceeding.

1.09 CLAIMS

- A. Do not perform any work which is considered to be outside the scope of the Contract Documents without an approved Change Order.
- B. File notice of claims with the Engineer within 10 days of the event giving rise to the claim.
- C. Provide full documentation within 30 days of the notice.
- D. Items not reported within the stipulated time will not be considered.

1. Failure to notify the Owner of potential claims does not allow the Owner to

- take alternative action to prevent the Contractor from incurring the cost for the item or to perform the work in a different manner.
2. Failure to notify the Owner does not allow operations to be monitored for the actual cost of performing the work.
- E. When full documentation has been received by the Engineer, the claim will be reviewed in the context of the Contract Documents.
1. If the claim is valid, a Change Order will be prepared and payment of the change Order will be recommended.
 2. If the claim is not valid, then the claim will be denied with an explanation of the reasons.
 3. Should the Contractor disagree with the decision of the Engineer, the Contractor may refuse to do the work.
 - a. If the Owner insists that the work be done, proceed with the work on a time and materials basis.
 - b. The validity of the claim will be resolved at a later time in accordance with the Contract Documents.

1.10 RECORD DOCUMENTS

A. Maintain at the site one (1) complete record copy of:

1. Drawings
2. Specifications
3. Addenda
4. Contract modifications
5. Approved shop drawings and record data
6. One (1) set of construction photographs
7. Test records
8. Clarifications and other information provided in RFI responses.

B. Marking Drawings

1. Label each document as "Project Record" in large printed letters.
2. Record information as construction is being performed.
 - a. Do not conceal any work until the required information is recorded.
 - b. Mark drawings to record actual construction, including the following:
 - 1) Depths of various elements of the foundation in relation to finished first floor datum or the top of walls.
 - 2) Horizontal and vertical locations of underground utilities and appurtenances constructed and existing utilities encountered during construction.
 - 3) Location of internal utilities and appurtenances concealed in the construction. Make reference to permanent structure on the surface. Include the following equipment:

- (a) Piping
 - (b) Ductwork
 - (c) Equipment and control devices requiring periodic maintenance or repair
 - (d) Valves, unions, traps, and tanks
 - (e) Services entrance
 - (f) Feeders
 - (g) Outlets
- 4) Changes of dimension and detail.
 - 5) Changes made by Field Order and Change Order.
 - 6) Details not on the original Contract Drawings.
- c. Mark specifications and addenda to record materials and the equipment provided.
 - 1) Record manufacturer name, trade name, catalog number, and each supplier (with address and phone number) of each product and item of equipment actually installed.
 - 2) Record changes made by Field Order and Change Order.
 - d. Mark additional work or information in erasable pencil.
 - 1) Use red for new or revised indication.
 - 2) Use purple for work deleted or not installed (lines to be removed).
 - 3) Highlight in yellow the items constructed per the plans.
 - e. Submit record documents to Engineer for review and acceptance 30 days prior to final completion of the project.
 - 1) Provide one (1) set of marked up drawings.
 - 2) Provide one (1) set of specifications.
 - f. Partial Payment Requests will not be recommended for payment if record documents are found to be: incomplete or not in order. Final payment will not be recommended without record documents.

PART 2- PRODUCTS (NOT INCLUDED)

PART 3- EXECUTION (NOT INCLUDED)

END OF SECTION

SECTION 01300 SUBMITTALS

1.00 PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Contractor shall submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
 - 1. Record the products incorporated into the Project for the Owner.
 - 2. Provide information for operation and maintenance of the Project.
 - 3. Provide information for the administration of the Contract.
 - 4. Allow the Engineer to advise the Owner if products proposed for the project by the Contractor conform, in general, with the design concepts of the Contract Documents.

- B. Contractors responsibility for full compliance with the Contract Documents is not relieved by the Engineers review of submittals, Contract modifications may only be approved by Change Order or Field Order.

1.02 CONTRACTORS RESPONSIBILITIES

- A. Review all submittals prior to submission.

- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction requirements.
 - 3. Location of all existing structures, utilities and equipment related to the submittals.
 - 4. Submittals are complete for their intended purpose.
 - 5. Conflicts between the submittals related to the various subcontractors and suppliers have been resolved.
 - 6. Quantities and dimensions shown on the submittals.

- C. Submit information per the procedures described in this section and detailed specifications.

- D. Furnish the following submittals:
 - 1. As specified in the attached Submittal Schedule.
 - 2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions.
 - 3. Submittals as required in the detailed specifications.
 - 4. Submittals not required will be returned without Engineer's review.

- E. Submit a schedule indicating the date submittals will be sent to the Engineer

and proposed dates that the product will be incorporated into the project. Make submittals promptly in accordance with the schedule so as to cause no delay in the project.

1. Submittals shall be sent to Engineer allowing a reasonable time for delivery, review and marking submittals. Time for review is to include time for resubmission if necessary and to allow adequate time for the ordering, fabrication, and delivery of the product.
2. Schedule submittal to provide all information for interrelated work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.

F. Installation of any products prior to the approval of shop drawings is done at the Contractors risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owners option.

G. Payment will not be made for products for which submittals are required until the submittals have been approved. Payment will not be made for products for which shop drawings or samples are required until these are approved by the Engineer.

1.03 QUALITY ASSURANCE

A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting this criteria will be returned without review.

B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including drawings and specifications as modified by Addenda, Field Orders and Change Orders.

C. Furnish and install products that fully comply with the information included in the submittal.

D. Review and approve submittals prior to submitting them to the Engineer for review. Submittals will not be accepted from subcontractors, suppliers, or anyone other than the Contractor.

1.04. OPERATION AND MAINTENANCE MANUAL

A. The Contractor shall obtain from the various Subcontractors various operation and maintenance data, replacement parts lists, maintenance schedule requirements, etc., and bind the information into a reference manual. Two sets shall be turned over to the Engineer/Architect prior to request for final payment.

- B. Operation and maintenance manuals shall be neatly bound with each trade so indexed. In some cases, approved shop drawings and submittals may suffice for use in this regard. Equipment parts lists for replacement purposes shall be included wherever possible.

1.05 SUBMITTAL PROCEDURES

- A. Deliver submittals to the Engineer.
- B. Assign a number to the documents originated to allow tracking of the submittal during the review process.
 - 1. Assign a number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

Prefix	Description	Originator
CO	Change Order	Contractor
CTR	Certified Test Report	Contractor
EIR	Equipment Installation Report	Contractor
FO	Field Order	Engineer
NBC	Notification by Contractor	Contractor
O&M	Operation & Maintenance Manuals	Contractor
PCM	Proposed Contract Modification	Engineer
PR	Payment Request	Contractor
PP	Project Photographs	Contractor
RD	Record Data	Contractor
RFI	Request for Information	Contractor
SAM	Sample	Contractor
SD	Shop Drawing	Contractor
SCH	Schedule of Progress	Contractor

- 2. Issue sequence numbers in chronological order for each type of submittal.
- 3. Issue numbers for re-submittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD-025-A represents a shop drawing that is the twenty-fifth submittal of his type and is the second time this submittal has been sent for review.
- 4. Clearly note the submittal number on each page or sheet of the submittal.
- 5. Correct assignment of numbers is essential since different submittal types are processed in different ways.

- D. Submit documents with uniform markings and page sizes.

- 1. Paper size shall allow for ease of reproduction.
 - a. Submit documents on 8-1/2" X 11" paper here practical.
 - b. Use 11" X 17" paper for larger drawings and schematics.

- c. Use full size blueline sheets for fabrications and layout drawings. Reproducible drawings may be submitted in lieu of bluelines.
2. Mark submittals to:
- a. Indicate Contractors corrections in green.
 - b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Manufacturers standard drawings or information sheets are provided.
 - c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.
 - d. Mark dimensions with the prefix FD to indicate field verified dimensions on the drawings.
 - e. Provide a blank space 8" x 3" for Contractor's and Engineers stamp.
- E. Mark submittals to reference the drawing number and/or section of the specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.
- F. The number of copies of each submittal to be sent by the Contractor and the number of copies of each submittal to be returned are:

Prefix	Description	No. of Copies Sent	No. of Copies Returned
CO	Change Order	2	1
CTR	Certified Test Report	2	0
EIR	Equipment Installation Report	2	0
NBC	Notification by Contractor	2	1
O&M	Preliminary O&M Manuals	2	1
O&M	Final O&M Manuals	4	0
PR	Payment Request	2	1
PP	Project Photographs (including videotapes)	2	0
RD	Record Data	2	0
RFI	Request for Information	2	1
SAM	Sample	2	0
SD	Shop Drawings	3	1
SCH	Schedule of Progress	2	0

1.06 REVIEW PROCEDURES

- A. Priority submittals will be reviewed before other submittals for this project which have been received but not reviewed.

1.07 REQUIREMENTS

A. Certifications, Warranties and Service Agreements include documents as specified in the detailed specifications, as shown in the submittal schedule or as follows:

1. Certified Test Reports (CTR) - A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the specifications.
2. Certification of Local Field Service (CLS) - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the project site. List names, addresses, and telephone numbers of approved service organizations on or attach to the certificate.
3. Extended Warranty (EW) - A guarantee of performance for the product or system beyond the normal one (1) year warranty described in the General Conditions, Issue the warranty certificate in the name of the Project Owner.
4. Extended Service Agreement (ESA) - A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period of time beyond the warranty period. Issue the service agreement in the name of the Project Owner.
5. Certification of Adequacy of Design (CAD) - A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
6. Certification of Applicator/Subcontractor (CSQ) - A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.

B. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the project and allow replacement or repair at some future date.

1. Provide record data for all products. Record data is not required for items for which shop drawings and/or operations and maintenance manuals are required.
2. Provide information only on the specified products. Submit a Contractor's Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting Record Data.
3. Record data will be received by the Engineer, logged, and provided to Owner for his/her record.
 - a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
 - b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are

noted during the cursory review performed to see that the information is adequate.

1.08 REQUESTS FOR DEVIATION

- A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the specifications.
- B. Submit request by Contractor's Modification Request (CMR) per Section 01040. PROJECT ADMINISTRATION. Identify the deviations and the reason the change is requested.
- C. Deviations that result in a reduction in cost shall also include the amount of the reduction to the Owner.
- D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.09 SUBMITTALS FOR SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.
- B. If the Contractor desires to submit a manufacturer or product which is not specified, the Contractor must submit the following for consideration of approval of the substitution:
 - 1. Contractor's Modification Request for deviation from the Contract Documents per Paragraph 1 .07.
 - 2. Prove that the product is acceptable as a substitute. It is not the Engineers responsibility to prove the product is not acceptable as a substitute.
 - a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
 - b. Make a direct comparison with the specified manufacturers published data sheets and available information. Provide this printed material with the submittal.
 - c. The decision of the Engineer regarding the acceptability of the proposed substituted product is final.
 - 3. Provide a typewritten certification that, in making the substitution request. The Contractor:
 - a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
 - b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.

- c. Will assume all responsibility to coordinate and modifications that may be necessary to incorporate the substituted product into the project and will waive all claims for additional work which may be necessary to incorporate the substituted product into the project which may subsequently become apparent.
- d. Will maintain the same time schedule as for the specified product.

1.10 GUARANTEES

- A. Warranties and guarantees shall be submitted as required by the Contract Documents and submitted with the shop drawings or record data.

1.11 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

1.12 ENGINEER'S DUTIES

- A. Revise the submittals and return with reasonable promptness.
- B. Affix stamp, indicate approval with or without comments, rejection, and the need for re-submittal.
- C. Distribute documents. SUBMITTAL SCHEDULE

Spec. No.	Description	S D	S A M	C T R	C L S	E W	E S A	C A D	C S Q	R D	O M	E I R	P P B
01568	Erosion and Sediment Control during Construction									X			
01600	Products									X			
01650	Starting Systems									X			
01700	Contract Closeout									X			
02556	Water Transmission Lines and/or Pressure Sewer Lines	X								X			
02570	Sanitary Sewer	X								X			
02575	Paving Repair and Resurfacing									X			
02590	Polyurethane Protective Coating									X			
03300	Cast in Place Concrete									X			
09101	Construction Traffic Control									X			
02223	Trench Protection System									X			
02236	Embankment		X							X			
02601	Flex base		X	X						X			
02610	Prime Coat		X	X						X			
02612	HMAC		X	X						X			

SD - Shop Drawing

SAM – Sample

CTR - Certified Test Report

CLS - Certification of Local Field Service

EW - Extended Warrant

ESA - Extended Service Agreement

PPB - Process Performance Bond

CAD - Certificate of Adequacy of Design

CSQ- Certification of Applicator/ Subcontractor Qualifications

RD - Record Data

OM - Operation and Maintenance Manuals

EIR - Equipment Installation Report

END OF SECTION

SECTION 01310 PROJECT CONTROL SCHEDULE

PART 1 - SCHEDULE REQUIREMENTS PROGRESS SCHEDULE

The work specified in this section includes planning, scheduling and reporting required by the CONTRACTOR. It is expressly understood and agreed that the time of beginning, the rate of progress, and the time of completion of the work are essential elements of this CONTRACT.

- A. The Project Control Schedule (PCS) shall be prepared and maintained by the CONTRACTOR as described in this section.
- B. The PCS shall be the CONTRACTOR'S working schedule and will be used by the CONTRACTOR to plan, organize, and execute the work, record and report actual performance and physical progress, and to show how the CONTRACTOR plans to complete all remaining work as of the beginning of each progress report period (data date).
- C. In addition, the PCS shall provide the OWNER with a tool to monitor and follow the progress of all phases of the work. The PCS shall comply with the various limits imposed by the scope of the work, contractually specified milestones and completion dates included in the contract.
- D. The PCS shall be a Critical Path Method (CPM) schedule, utilizing the Precedence Diagramming Method (PDM).
- E. The PCS must clearly show the sequence and interdependence of activities required for complete performance of the work, beginning with the Contract Start Date (CSD) and concluding with the Contract Completion Date (CCD). The maximum duration of any physical work activity shall not exceed twenty (20) working days unless approved by the OWNER.
- F. The CONTRACTOR shall use a scheduling system capable of handling, processing, printing and plotting data to satisfy all requirements of this section. The scheduling system must be capable of producing project reports and other digital (electronic) data that can be directly read and interpreted by the OWNER.

PART 2 - SUBMITTAL PROCEDURES

The OWNER will schedule and conduct a Preconstruction Conference. At this meeting, the requirements of this section, as they apply to the contract, will be reviewed with the CONTRACTOR. The CONTRACTOR shall be prepared to review and discuss methodology for the schedule and sequence of operations and labor, equipment and material constraints.

- A. PROJECT CONTROL SCHEDULE (PCS)(PRELIMINARY) - within fifteen (15) working days after the Preconstruction Conference, the CONTRACTOR shall submit to the OWNER the Preliminary Project Schedule (PPS), which shall be the basis of the PROJECT CONTROL SCHEDULE (BASELINE), and which will be used to schedule early activities of the project. The PPS shall include a detailed plan of operations for the first sixty (60) calendar days from the Contract Start Date.

The PPS shall be a network diagram or bar chart, utilizing the CONTRACTOR'S WORK BREAKDOWN STRUCTURE showing in detail:

1. Notice of Acceptance of Proposal.
2. Pre-Construction Conference.
3. Contract start date.
4. Mobilization.
5. Submission and approval of key submittals.
6. Procurement of key materials and equipment.
7. All activities occurring or starting within the first sixty (60) calendar days.
8. Milestones and other contractual dates.
9. Contract completion date.

- B. Submittal and acceptance of the Preliminary Project Schedule is a condition precedent to the issuance of any initial payment.
- C. PROJECT CONTROL SCHEDULE (BASELINE) - within sixty (60) calendar days of the CSD, the CONTRACTOR shall submit, for acceptance by the OWNER, the Project Control Schedule (Baseline). The PCS-Baseline shall represent the CONTRACTOR'S complete plan for the execution of the CONTRACT in accordance with the BID and CONTRACT documents. Although limited technical assistance is available to the CONTRACTOR from the OWNER upon written request and prior to any formal review and/or finalization of the baseline schedule, it is the responsibility of the CONTRACTOR to employ or engage the services of a technically qualified scheduler on this project.
- D. PROJECT CONTROL SCHEDULE (UPDATES) - Once each month, or more often if deemed necessary by the OWNER, the CONTRACTOR shall review and update the PCS to incorporate all current information, including progress, approved adjustments of time and logic, and proposed changes in sequence and logic. All copies of the updated PCS submitted to the OWNER, shall be signed and dated by the CONTRACTOR.
- E. PROJECT CONTROL SCHEDULE (AS-BUILT) - The last PCS update submitted shall be identified as the "As-Built Schedule", and is a condition precedent to issuance of Final Acceptance of the CONTRACT by the OWNER.

PART 3 – DEFINITIONS

The principles and definitions of the terms used herein shall be as set forth in the Associated General Contractors of America (AGC) publication "The Use of CPM in Construction," copyright 1976. Additional definitions are set forth as follows:

- A. Critical Path(s) - shall be defined as the longest path of activities from the Contract Start Date (CSD) to the Contract Completion Date (CCD).
- B. Near Critical Path - shall be defined as those paths of activities having a total float value equal to the total float value of the defined critical path (longest path) plus ten (10) working days.
- C. Activity Codes - are values assigned to schedule activities to organize the Schedule Activities into manageable groups for updating, analyzing, reporting, plotting, and summarizing.
- D. WBS - (Work Breakdown Structure) is a definition of project related activity codes, to be used by the CONTRACTOR to organize the CONTRACTOR'S Project Control Schedule in a manner that facilitates the OWNER'S use of the PCS information.
- E. Constraint - is a restriction imposed on the start, finish or duration of an activity. Project Control Schedule.
- F. Data Date - (DD) The date used as the starting point for schedule calculations. For Baselines, the DD is the first day of the project, the CSD date. For subsequent schedule updates, the DD is the first workday of the remainder of the schedule, normally the first calendar day after the schedule close-out date (usually month end).
- G. Total Float - is the amount of time that the start or finish of an activity can be delayed without impacting the Contract Completion Date. Total float is a CALCULATED value.
- H. Free Float - is the amount of time that the start or finish of an activity can be delayed without impacting the early start or finish of a successor activity. Free float is a CALCULATED value.
- I. Lag - is an offset or delay from an activity to its' successor, or from its' predecessor. Lag is physically defined by the scheduler. Lag is NOT CALCULATED.
- J. Open End - is an activity that has either no predecessor or no successor relationships.
- K. Out of Sequence Progress - means that all or a portion of an activity has been completed before the predecessors to the activity are complete.

- L. Percent Complete - the portion of an activity that is complete based on physical measurement of the scope of work included in the activity that has been completed by the CONTRACTOR and accepted by the OWNER.
- M. Target (Baseline) - a different version of the project schedule that can be compared to as the basis for measuring differences between the versions of the project schedule.

PART 4 - PROJECT CONTROL SCHEDULE (BASELINE)

The CONTRACTOR shall be responsible for assuring that all work sequences are logical and the network shows a coordinated plan for the complete performance of the CONTRACT. Failure of the CONTRACTOR to include any element of the work required for the performance of the CONTRACT in the network shall not relieve the CONTRACTOR from completing all work within the time specified for the completion of the CONTRACT. In the event the CONTRACTOR fails to define any element of the work in the network, when the omission or error is discovered by either the CONTRACTOR or OWNER, it shall be corrected by the CONTRACTOR at the next scheduled update or submittal.

- A. The PCS Baseline shall be organized to clearly define separate groups of activities detailing:
 - 1. key submittals,
 - 2. procurement of major materials and equipment,
 - 3. delivery of OWNER furnished materials and equipment,
 - 4. approvals required by regulatory agencies or other third parties,
 - 5. plans for all major subcontract work,
 - 6. access to and availability of all work areas,
 - 7. identification of interfaces and dependencies with preceding, concurrent, and follow-on contractors,
 - 8. tests and inspections,
 - 9. identification of any manpower, material or equipment restrictions.
- B. Relationships shall be defined between the CONTRACTOR'S activities based on the following criteria.

PHYSICAL - relationships occur when a successor activity cannot physically start (or finish) until a predecessor activity completes (or starts). **example: forming before pouring**

SAFETY - defined relationships exist when a successor activity cannot start until a predecessor activity (which may be creating a safety hazard for the successor activity), completes allowing for the start of the successor in a safe environment. **example: completing overhead work before starting work underneath**

RESOURCE - driven relationships occur when a successor activity cannot start until a predecessor activity completes and releases its' resources to work on the successor. **example: form slab # 1 before forming slab # 2 when allocating one crew to a job**

PREFERENTIAL - logic occurs when a contractor prefers to perform the work in a given sequence. **example: completing painting before starting finished flooring**

NOTE: The basis of Safety, Resource and Preferential logic requirements for all critical or near critical activities shall be documented in the Baseline Schedule Narrative or as requested by the OWNER.

- C. The basis of constraints and lags utilized in the PCS-BASELINE and subsequent UPDATES must be documented in an accompanying schedule narrative.
- D. The CONTRACTOR shall not utilize float suppression techniques or artificial restraints, constraints, lags or durations to lessen or control the amount of total or free float contained in the network.
- E. Float shall not be considered as time for the exclusive use of or benefit of either the OWNER or the CONTRACTOR. Float shall be considered as a resource available to both parties for the benefit of the project.
- F. Early Completion - An early completion schedule is one which anticipates completion of the work ahead of the corresponding Contract Time. Since Total Float is measured to the Contract Completion Date (CCD), and belongs to the Project, the CONTRACTOR shall not be entitled to any extension in Contract Time, or recovery for any delay incurred because of extensions in an early completion date, until all total float is used or consumed and performance or completion of the WORK extends beyond the corresponding Contract Time.
- G. Project Schedule Reports shall be submitted to the OWNER as follows:

Graphics - 11" x 17" (Tabloid)

- 1. Time Scaled Logic Diagram based on early dates, organized by OWNERWBS Codes with the longest (critical) path printed in red. (Attachment A.)
- 2. Bar chart, organized by CONTRACTOR-WBS, indicating early and late date bars with critical path printed in red.

Graphics – 8½" x 11" (A size)

- 3. Detailed Bar Chart, Grouped by CONTRACTOR-WBS
- 4. Estimated Cash Flow Histogram (if cost loaded) with planned value per period (bar) and cumulative to date (curve).

Tabular Reports – 8½" x 11" (A size)

5. Predecessor / Successor listing including relationship type and lag value, organized by Activity ID.
6. Tabular activity listing, sorted by Activity ID, with Early and Late Dates, Total and Free Float values.
7. Tabular activity listing, Grouped by Responsible party, sorted by Early Start, with Early Dates, Total and Free Float values.
8. Listing of all schedule constraints and open ends with explanation of each.
9. Identification of all lags contained in relationships and explanation of each.
10. Narrative report explaining the key "basis and assumptions" of the Project Control Schedule Baseline schedule.
11. Submittal / Procurement Status Report - A P3 Activity Matrix Report detailing for each submittal item, the Planned Dates for each step in the submittal/ procurement process.
12. Bid Item Listing.

H. Submittal

1. Six (6) sets of all graphics
2. Six (6) sets of all tabular reports

I. Acceptance

1. The OWNER may accept the PCS-Baseline submittal and subsequent updates as having been submitted in accordance with the Contract Specifications. The OWNER will review and make comments on the PCS. Meetings may be held between the OWNER and the CONTRACTOR, and all SUBCONTRACTORS and SUPPLIERS whom the CONTRACTOR may desire to invite or whom the OWNER may request are present.
2. The PCS submittal must meet in all respects the time and order of work requirements of the contract. The work shall be executed in the sequence indicated in the accepted baseline and subsequent accepted updates and revisions. If the CONTRACTOR changes the sequence of work, a baseline revision submittal will be required in accordance with Section 4.10.
3. Comments made by the OWNER on the PCS or any subsequent updates and revisions, will not relieve the CONTRACTOR from compliance with requirements of the Contract Documents.
4. If requested by the OWNER at any time during the project, the CONTRACTOR shall provide detailed, short term schedules for specific items of the work.

J. Baseline Schedule Revisions

1. No change shall be made to the accepted Project Control Schedule Baseline without the prior written authorization of the OWNER.
2. If the CONTRACTOR desires or the OWNER requests that the PCS Baseline be revised to reflect specific ISSUES of the current project plan, the

CONTRACTOR shall prepare a detailed analysis of the time related impacts of the specific ISSUE, demonstrating how the CONTRACTOR proposes to incorporate the ISSUE into the PCS Baseline.

3. Each time impact analysis shall be submitted prior to approval of any change in the contract to facilitate the incorporation of the impact in the next schedule submittal by the CONTRACTOR.
4. Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the remaining total float along the path of activities impacted by the ISSUE.
5. When an authorized revision is made to the PCS Baseline, the revised baseline shall be identified by a Revision Number, giving the revised Baseline a distinct identification separate from all previous or subsequent Baseline Revisions.

K. Schedule Updates

1. The CONTRACTOR shall submit the Project Control Schedule - Update to the OWNER each month, on a date assigned by the OWNER. The Update submittal shall include all information available up to the Data Date established by the OWNER.
2. The PCS-Update submittal shall be reviewed jointly (if necessary) with the OWNER for the purpose of verifying update information. The OWNER may request key SUBCONTRACTORS or SUPPLIERS to participate in the review with the CONTRACTOR. Information to verify includes but is not limited to:
 - a) Actual start / finish dates for activities started or finished in the current period.
 - b) Activity Percent Complete for activities that are currently in progress.
 - c) Remaining durations or expected finish dates for activities that are currently in progress.
 - d) Revised logic (as-built and projected) and changes in activity durations.
 - e) Impacts of Issues identified by the CONTRACTOR or OWNER.
 - f) Incorporation of OWNER approved time extensions.
3. The CONTRACTOR may not make changes to any actual events previously entered in prior updates without written concurrence by the OWNER.

4. PCS-Update submittals shall be prepared as follows:

Graphics - 11" x 17" (Tabloid size)

- a) Time scaled Logic Diagram of early dates, organized by WBS Codes with the calculated critical path printed in red.
- b) Bar chart, organized by WBS Codes, indicating early and late dates with critical path printed in red, with Target (Baseline) Bar.

Graphics - 8½" x 11" (A size)

- c) Detailed Bar Chart, Grouped by OWNER-WBS, with Target (Baseline) Bar.

Tabular Reports - 8½" x 11" (A size)

- d) Tabular activity listing, sorted by Activity ID, with Early and Late Dates, with Total and Free Float values.
- e) Tabular activity listing, sorted by Early Start, with Current Early and Current Baseline dates and Variance between Current Early and Current Baseline Finish Dates.
- f) Tabular activity listing, Grouped by Responsible party, sorted by Early Start, with Early Dates, Total and Free Float values.
- g) Listing of any NEW or DELETED schedule constraints and open ends with explanation of each.
- h) Identification of all NEW or DELETED lags contained in relationships and explanation of each.
- i) Identification of all NEW or DELETED activities and an explanation of each.
- j) Narrative report including description of problem areas, current and anticipated delaying factors, and their expected impact, and an explanation of current actions taken or proposed. In addition, alternative for possible schedule recovery to mitigate any potential delay and/or cost increases should be included in the monthly narrative by the CONTRACTOR.
- k) Submittal/Procurement Status Report. l) Bid Item Listing Report.
- m) If the CONTRACTOR fails to submit any of the PCS update submittal deliverables, the OWNER may withhold approval of progress payment estimates until such time as the CONTRACTOR submits the required update submittal.

PART 5 - PAYMENT FOR PROJECT CONTROL SCHEDULE

- A. Project Control Schedule will be considered incidental to the cost of the overall project. There shall be no separate pay for the Project Schedule.

END OF SECTION

SECTION 01411 ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

The contractor shall perform the work minimizing environmental pollution and damage as the result of construction operations. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

A. SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

B. PERMITS

The Contractor shall obtain all needed permits or licenses. The Owner will not obtain any permits for this project. The Environmental Protection Agency (EPA), through the national pollutant discharge elimination system (NPDES), requires general permits, a notice of intent, and a notice of discontinuation. The Contractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed and for payment of all fees.

C. PRECONSTRUCTION SURVEY

Prior to starting any onsite construction activities, the Contractor and Owner shall make a joint condition survey, after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs, and grassed areas immediately adjacent to work sites and adjacent to the assigned storage area and access routes as applicable. This report will be signed by both the owner and the Contractor upon mutual agreement as to its accuracy and completeness.

D. MEETINGS

The Contractor shall meet with representatives of the Owner to change the environmental protection plan as needed for compliance with the environmental pollution control program.

E. NOTIFICATION

The Owner will notify the Contractor in writing of any observed noncompliance with the previously mentioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Owner of proposed corrective action and take such action when approved. If the Contractor fails to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspensions.

F. PREVIOUSLY USED EQUIPMENT

The Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed.

G. PAYMENT

No separate payment will be made for work covered under this section; all costs associated with this section shall be included in the contract unit and/or lump sum prices in the Bidding Schedule.

1.02 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth or other material displaced into uncleared areas shall be removed.

A. WORK AREA LIMITS

Prior to any construction, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor's personnel shall be knowledgeable of the purpose

for marking and/or protecting particular objects.

B. LANDSCAPE

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. Fencing shall be erected at sufficient distance from a tree trunk (usually equal to the diameter of the tree crown) to prevent compaction of soil over the root spread.

C. UNPROTECTED ERODIBLE SOILS

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthworks shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be totally cleared. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by the Owner.

D. DISTURBED AREAS

The Contractor shall effectively prevent erosion and control sedimentation through approved methods and Best Management Practices (BMP's) including, but not limited to, the following:

1. Retardation and control of runoff. Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, and by any measures required by area wide plans under the Clean Water Act.
2. Erosion and sedimentation control devices. The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated on the drawings. Berms, dikes, drains, sedimentation basins, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.
3. Sediment basins. Sediment from construction areas maybe trapped in temporary or permanent sediment basins in accordance with the drawings. The basins shall accommodate the runoff of a local 5 year storm (6.1" in 24 hours). After each storm, the basins shall be pumped dry and accumulated sediment shall be removed to maintain basin effectiveness. Overflow shall be controlled by paved weirs or by vertical overflow pipes. The collected topsoil sediment shall be reused for fill on the construction site, and/or stockpiled for use at another site. The Contractor shall institute effluent

quality monitoring programs as requested by State and local environmental agencies.

4. De-watering of site and control of water quality. All water discharged from any excavation will be deposited at approved locations only. The Contractor will monitor water quality and not dispose of any material illegally. De-watering methods will be included in the Contractor's SWPPP.

E. CONTRACTOR FACILITIES AND WORK AREAS

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Owner. Temporary movement or relocation of Contractor facilities shall be made only when approved. Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings. Temporary excavation and embankments for plan and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.03 WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve. Monitoring of water areas affected by construction shall be the Contractor's responsibility. All water areas affected by construction activities shall be monitored by the Contractor.

A. WASHING AND CURING WATER

Waste waters directly derived from construction activities shall not be allowed to enter stormwater or wastewater facilities.

B. FISH AND WILDLIFE

The Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife.

1.04 AIR RESOURCES

Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with the State of

Texas rules and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality, if required, shall be the Contractor's responsibility. All air areas affected by the construction activities shall be monitored by the Contractor. Monitoring results will be periodically reviewed by the Owner to ensure compliance.

A. PARTICULATES

Dust particles, aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

B. HYDROCARBONS AND CARBON MONOXIDE

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

C. ODORS

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

D. SOUND INTRUSIONS

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor shall comply with the provisions of the City ordinances.

1.05 WASTE DISPOSAL

Disposal of wastes shall comply with all applicable City requirements and as specified below.

A. SOLID WASTES

Solid wastes (excluding clearing debris) shall be placed in containers and emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. Contractor shall dispose of classified non-hazardous solid waste at disposal area. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

B. HAZARDOUS WASTES

The Contractor shall take sufficient measures to prevent spillage of hazardous materials during dispensing and collect waste in suitable containers observing compatibility. Toxic materials shall not be used within the construction site. The Contractor shall immediately transport hazardous waste and dispose of it in compliance with Federal and local laws and regulations. Storage of hazardous waste on the construction site is prohibited. Spills of hazardous materials shall be immediately reported to the Owner. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility.

C. BURNING

Burning will not be allowed.

1.06 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area will be so designated by the Owner, if any has been identified. The Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. The Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the contract. If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone charcoal, or other deposits; rocks or coral alignments, paving, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Owner. While waiting for instructions the Contractor shall record, report, and preserve the finds in accordance with the requirements of the Texas State Historical Preservation Office.

1.07 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction.

1.08 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas at no costs to the OWNER.

1.09 MAINTENANCE OF ANTI-POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.10 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01460 LABORATORY TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This item shall consist of all required testing and inspection services required to provide certification that the completed construction is in substantial compliance with the contract, plans and specifications.
- B. Testing and inspections shall include: all underground utilities (water, sewer & drainage), roadway embankment, subgrade, base & asphalt, curbs of all types, concrete pavements, concrete structures, signage, striping, and all other facilities as may be included in the overall scope of construction.
- C. Inspections may include observations to determine compliance with the prescribed stormwater pollution prevention plan (SW3P), trench safety, personal protection equipment and traffic control plans.
- D. The ENGINEER has the authority to observe, test, inspect, approve, and accept the work. The ENGINEER decides all questions about the quality and acceptability of materials, work performed, work progress, Contract interpretations, and acceptable Contract fulfillment. The ENGINEER has the authority to enforce and make effective these decisions.
- E. The ENGINEER acts as a referee in all questions arising under the terms of the Contract. The ENGINEER's decisions will be final and binding.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION

3.01 LABORATORY TESTING

- A. All required laboratory testing shall be completed by an independent, qualified testing laboratory approved by the CITY. All initial testing shall be paid for by the CITY. Any retesting required shall be paid for by the CONTRACTOR.
- B. Cost for additional review time will be billed to the CONTRACTOR by the OWNER for the actual hours required for the re-testing in accordance with the current rates as established by the contract between the CITY and the Testing Lab. Cost for the additional review shall be paid to the OWNER by the CONTRACTOR on a monthly basis.

3.02 INSPECTIONS

- A. PROVIDERS: All required inspections shall be provided by either the independent testing laboratory or by the City of Edinburg Engineering department staff. All initial inspections conducted during normal business hours (8:00 am to 5:00 pm, Monday – Friday, excluding Holidays) shall be provided by the CITY at no charge. Any inspections or testing requested by the CONTRACTOR to be provided at any other time will be paid for by the CONTRACTOR. Any re-inspections or re-testing required shall be paid for by the CONTRACTOR.
- B. COSTS: Cost for additional review time will be billed to the CONTRACTOR by the OWNER for the actual hours required for the retesting in accordance with the current rates as established by the contract between the CITY and the Testing Lab. Cost for the additional review shall be paid to the Owner by the CONTRACTOR on a monthly basis.
- C. INSPECTORS: Inspectors are authorized representatives of the ENGINEER. Inspectors are authorized to examine all work performed and materials furnished, including preparation, fabrication, and material manufacture. Inspectors inform the CONTRACTOR of failures to meet Contract requirements. Inspectors may reject work or materials and may suspend work until any issues can be referred to and decided by the ENGINEER. Inspectors cannot alter, add, or waive Contract provisions, issue instructions contrary to the Contract, act as foremen for the CONTRACTOR, or interfere with the management of the work. Inspection or lack of inspection will not relieve the CONTRACTOR from obligation to provide materials or perform the work in accordance with the Contract. CONTRACTOR shall provide safe access to all parts of the work and provide information and assistance to the ENGINEER to allow a complete and detailed inspection and give the ENGINEER sufficient notice to inspect the work. Work performed without suitable inspection, as determined by the ENGINEER, may be ordered removed and replaced at CONTRACTOR's expense. CONTRACTOR shall remove or uncover portions of finished work as directed. Once inspected, restore work to Contract requirements. If the uncovered work is acceptable, the costs to uncover, remove, and replace or make good the parts removed will be paid for in accordance "Changes in the Work." If the work is unacceptable, CONTRACTOR shall assume all costs associated with repair or replacement, including the costs to uncover, remove, and replace or make good the parts removed. When a government entity, utility, railroad company, or other entity accepts or pays a portion of the Contract, that organization's representatives may inspect the work but cannot direct the CONTRACTOR. The right of inspection does not make that entity a party to the Contract and does not interfere with the rights of the parties to the Contract.
- D. FINAL INSPECTION: After all work is complete, the CONTRACTOR will request a final inspection by the ENGINEER authorized to accept the work. The

final inspection will be made as soon as possible, and not later than 10 calendar days after the request. No working day charges will be made between the date of request and final inspection. After the final inspection, if the work is satisfactory, the ENGINEER will notify the CONTRACTOR in writing of the final acceptance of the work. If the final inspection finds any work to be unsatisfactory, the ENGINEER will identify in writing all deficiencies in the work requiring correction. Correct the deficiencies identified. Working day charges will resume if these deficiencies are not corrected within 7 calendar days, unless otherwise authorized by the ENGINEER. Upon correction, the ENGINEER will make an inspection to verify that all deficiencies were corrected satisfactorily. The ENGINEER will provide written notice of the final acceptance.

3.03 SCHEDULING

- A. It shall be the CONTRACTOR'S responsibility to contact either the testing lab or the City of Edinburg Engineering staff at least 48 hours before the required testing or inspection is to occur.
- B. It shall be the CONTRACTOR'S responsibility to plan the construction in such a manner to allow the appropriate tests and inspections to be conducted without disruption to the construction process.

3.04 PREPARATION

- A. CONTRACTOR shall be responsible for preparing the project site as necessary to conduct all required testing. This shall include, but may not be limited to: proper grading of construction site, completion of required compaction activities, complete installation of all forms, installation of all required reference points (grade stakes), provision of adequate traffic control, additional personnel and/or supplies and all necessary safety measures (i.e. OSHA compliant Trench Safety) as needed.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. This work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

4.02 PAYMENT

- A. No separate payment shall be made for this item.

END OF SECTION

01564 GROUND WATER HANDLING

PART 1 - GENERAL

1.01 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. Protecting work against surface runoff and rising flood waters. C. Disposing of removed water.

1.02 REFERENCES:

- A. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
- B. Federal Register 40 CFR (Vol. 53. No. 222) Part 122, EPA Administrator permit Programs (NPDES), Pam 122.26 (b) (14) Storm Water Discharge.

1.03 DEFINITIONS:

- A. Ground water control includes both dewatering and depressurization of water-bearing soil layers using well points, for either vacuum or educator systems, or deep wells. Use of sump pumps does not constitute ground water control.
 - 1. Dewatering is 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 water.
 - 2. Depressurization is reduction of piezometric pressure within a soil strata not controlled by dewatering alone.
- B. Control of excavation drainage by sump pumping includes operating the sump pump and drainage facilities installed to collect water in the sump.
- C. Control of surface drainage is diversion of surface water away from excavations.

1.04 PERFORMANCE REQUIREMENTS:

- A. Conduct subsurface investigations as needed to identify ground water conditions and to provide parameters for installation and operation of ground water control systems. Perform pump tests, if necessary, to determine drawdown characteristics of water bearing layers.
- B. Develop a ground water control system, compatible with requirements of Federal Regulations 29 CER Part 1926, to produce the following results:

1. Reduce hydrostatic pressure affecting excavations to the following levels as determined by piezometer observations.
 - a. For structural excavations, reduce the piezometric level to at least 3 feet below the excavation bottom elevation or within 2 feet above the top of clay layers.
 - b. Where hydrostatic pressure in a confined water-bearing layer exist below the excavation, depressurize this zone to eliminate risk of uplift or other instability of the excavation or installed works.
 2. Develop stable subgrade for subsequent construction operations.
 3. Reduce hydrostatic pressure for tunnel excavations as necessary to maintain face stability, grade control, and to control seepage into tunnel
- C. 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.
- D. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- E. 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, if they affect potentially contaminated areas

1.05 SUBMITTALS:

- A. Contractor to submit a Dewatering Plan to include: list of equipment to be used, pump capacity, length of dewatering operations to be in effect at any time, identification of point(s) of discharge, identification of location(s) of turbidity control measures.

1.06 ENVIRONMENTAL REQUIREMENTS:

- A. Comply with the Texas Commission on Environmental Quality regulations and Texas Water Well Driller Association for development, drilling, and abandonment of wells used in dewatering system.
- B. Where potentially contaminated areas are indicated on the Drawings, monitor ground water discharge for contamination in accordance with the Project Engineer's instructions.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. Equipment and materials are at the option of Contractor as necessary to achieve

desired results for ground water control. Ground water control systems may include single-stage or multiple-stage well point systems, educator and ejector-type systems, deep wells, or combinations of these equipment types. Excavation drainage and surface drainage may also include sump pumping subsidiary to bid item.

- B. Maintain equipment in good repair and operating order.
- C. Arrange for standby equipment and materials where required.

PART 3 - EXECUTION

3.01 GROUND WATER CONTROL

- A. Install, operate and maintain the ground water control system in a manner compatible with construction methods and site conditions. Notify Project Engineer in writing of any changes made to accommodate field conditions and changes to the Work.
- B. For above ground piping in ground water control system, include a length of clear transparent piping between every well point and discharge header so that discharge from each installation can be visually monitored.
- C. Replace installations that produce noticeable amounts of sediments after development.
- D. Provide additional ground water control installations, or change the methods, if the installation does not achieve satisfactory results.
- E. Do not allow piezometric pressure levels to rise until foundation concrete has achieved design strength.
- F. During backfilling, dewatering may be reduced to maintain water level a minimum of 2 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.
- G. Remove ground water control installations.
 - 1. Remove pumping system components and piping when ground water control is no longer required.
 - 2. Remove monitoring wells when directed by the Project Engineer.
 - 3. Grout abandoned well. Fill piping that is not removed with cement- bentonite grout or cement-sand grout.

3.02 MAINTENANCE AND OBSERVATION

- A. Conduct daily maintenance and observation of the ground water control systems.
- B. Replace inoperable or damaged system components as necessary to maintain operation.
- C. Keep monitoring system piping accessible for observation,

3.03 MONITORING AND RECORDING

- A. Observe and record elevation of water level daily as long as ground water control system is in operation. Observe levels weekly thereafter until the Work is completed or piezometers or wells are removed. Initiate more frequent observation when the Project Engineer determines that more frequent monitoring and recording are required.

3.04 SURFACE WATER CONTROL

- A. Intercept surface water and divert it away from excavations. This includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.
- B. Drive surface water and seepage water into sumps and pump it into drainage channels, setting basins, or storm drains,

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

The work as provided for by this specification shall be measured as lump sum or as noted on the bid request. When no line item is included in the Bid Proposal, this work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

4.02 PAYMENT

When shown as a specific line item in the proposal, the work as prescribed for in this specification shall include all labor, tools, equipment, over-excavation, trench bedding, backfilling, materials, and incidentals necessary to complete the work.

END OF SECTION

SECTION 01568 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 - GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.

The intent of this specification is to provide guidelines for the Contractor to adhere to all State, Federal, and Local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system, including open channels. It is the Contractor's responsibility to adhere to all State, Federal and Local requirements. While the Owner may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.02 QUALITY ASSURANCE

- A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner or the Engineer.
- C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the time of exposure.
- D. Surface water runoff originating upgrate of exposed area shall be controlled to reduce erosion and sediment loss during the period of exposure.
- E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving ditch or stream, the Contractor shall install measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream as directed by the Owner or the Engineer.

- F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation damage.
- G. The Contractor shall be responsible for periodically cleaning out and disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. The Contractor shall also be responsible for cleaning out and disposing of all sediment at the time of completion of the Work.

1.03 SUBMITTALS

Submittals shall be in accordance with Section 01300, SUBMITTALS, and shall include:

- A. Manufacturer's Literature: Descriptive data of installation methods and procedures.
- B. Certificates: Manufacturer's certification that materials meet specification requirements.

1.04 JOB CONDITIONS AND ORDINANCES

Comply with the local ordinances. If local ordinances require *more* stringent or additional erosion and sediment control measures during construction, Contractor shall provide such measures.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. STRAW BALES: Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least 30" in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string. Jute or cotton binding is unacceptable. Bales shall be used for not more than three months before being replaced. However, if weather conditions cause biological degradation of the straw bales, they shall be replaced sooner than the three month time period to prevent a loss of structural integrity of the like.
- B. SILT FENCE: Silt fence fabric shall be a nylon reinforced polypropylene fabric which has a built-in cord running the entire length of the top edge of the fabric. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632	90
lbs. Puncture Rating, ASTM D4833	60
lbs. Mullen Burst Rating, ASTM D3786	200
psi. Apparent Opening Size, U.S. Sieve No.40	

Silt fence shall be “Enviro Fence” preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

- C. SILT FENCE POSTS: A minimum 2” x 2” (nominal) x 54” pressure treated wood posts of Number 2 Grade southern yellow pine or approved equal.
- D. SAND BAG: Sand bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%. Length shall be 24 to 30 inches, width shall be 16 to 18 inches and thickness shall be six (6) to eight (8) inches and having an approximate weight of 40 pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.
- E. P.V.C. PIPE: Pipe shall be SDR-35 polyvinyl chloride having a minimum nominal internal diameter of 4”. Pipes shall be sized for anticipated flows.
- F. SOIL RETENTION BLANKET: Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net attached to the top side. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant without the use of chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. The soil retention blanket shall be one (1) of the following classes and types:
 - 1. Class 1. “Slope Protection”
 - (a) Type A. Slopes of 3:1 or flatter-Clay soils
 - (b) Type B. Slopes of 3:1 or flatter - Sandy soils
 - (c) Type C. Slopes steeper than 3:1 - Clay soils
 - (d) Type D. Slopes steeper than 3:1 - Sandy soils
 - 2. Class 2. “Flexible Channel Liner”
 - (a) Type E. Short-term duration (Up to 2 Years) Shear Stress (t_d) <1.0 lb./sq. ft.
 - (b) Type F. Short-term duration (Up to 2 Years) Shear Stress (t_d) 1.0 to 2.0 lb./sq. ft.
 - (c) Type C. Long-term duration (Longer than 2 Years) Shear Stress (t_d) > 2.0 to < 5.0 lb./sq. ft.
 - (d) Type H. Long-term duration (Longer than 2 Years) Shear Stress (t_d) greater than 0 Equal to 5.0 lb./sq. ft.

The Contractor has the option of selecting an approved soil retention blanket provided that selection conforms to the following list of approved soil retention blankets for slope protection applications:

CLASS I. SLOPE PROTECTION

TYPE A: Slopes of 3:1 or Flatter- Clay Soils

Airtrol® ANTI-WASH®/GEOJUTE®
(Regular) Contech Standards®
Contech Standards Plus®
Green Triangle Regular®
Green Triangle Superior®
GREENSTREAK® PEC
MAT Curlex®
North American Green® S150
North American Green® S75
North American Green® SC 150
POLYJUTEÔ
407/GT SOIL
SAVER®
TerraJute®
Verdyol® ERO-
MAT® Xcel
Regular®
Xcel Superior®

TYPE B: Slopes of 3:1 or Flatter-Sandy Soils

Contech Standards®
Contech Standards Plus®
GEOCOIR®/DEKOWE®
700
Green Triangle Superior®
Green Triangle Regular®
North American Green®
575
North American Green® SC 150
North American Green® S150
POLYJUTEO
407/CT TerraJute®
Verdyol® ERO-
MAT® Xcel
Superior®
Xcel Regular®

TYPE C: Slopes Steeper than 3:1-Clay Soils

Airtrol®
ANTI-WASH®/GEOJUTE®
(Regular) Contech Standards
Plus®
Curlex®

Green Triangle Superior®
GREENSTREAK® PEC-MAT
North American Green® SC
150
North American Green® S150
POLYJUTEÔ
407/CT SOIL
SAVER®
TerraJute®
Xcel Superior®

TYPE D: Slopes Steeper than 3:1-Sandy Soils

Contech Standards Plus®
GEOCOIR®/DEKOWE®7
00
Green Triangle Superior®
North American
Green®S150
North American Green®SC150
POLYJUTEÔ
407GT TerraJute®
Xcel Superior®

CLASS II: FLEXIBLE CHANNEL LINER PROTECTION

PART 3 - EXECUTION

3.01 PREPARATION

- A. Contractor shall prepare the site for installation of the erosion and sediment control devices in accordance with the manufacturer's recommendations when applicable. At all times, CONTRACTOR shall take extreme care during the installation of the applicable devices to minimize disturbance of the project site.

3.02 INSTALLATION

- A. TEMPORARY STRAW BALE DIKE
1. Straw bales shall be embedded a minimum of 4" and securely anchored using 2" x 2" wood stakes driven through the bales into the ground a minimum of 6". Straw bales are to be placed directly adjacent to one another leaving no gap between them.
 2. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are

higher in elevation than the top of the lowest middle bale. Additional bales shall be placed behind the first row where the bales abut each other. The additional bale is used to prevent unfiltered runoff from escaping between the bales.

3. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4" above ground level on the uphill side. Loose straw shall be scattered over the area immediately uphill from a straw barrier.

B. SILT FENCE

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. The Contractor shall excavate a 6 inch wide by 6 inch deep trench for site fence bedding along the lower perimeters of the site where necessary to prevent sediment from entering any drainage system. The Contractor shall install the silt fence in accordance with the manufacturer's recommendations and instructions. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6" or installation of support post to depth of 12". Fabric shall overlap at abutting ends a minimum of 3' and shall be jointed such that no leakage or bypass occurs. If concentrated flow occurs after installation, corrective action must be taken such as placing rock berm in the areas of concentrated flow.

C. SAND BAG BERM

1. The purpose of a sandbag berm is to intercept sediment-laden water from disturbed areas such as construction in stream beds, create a retention pond, detain sediment and release water in sheet flow.
2. A temporary sand bag berm shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5 acres. The berm shall be a minimum height of 18", measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized to have a minimum width of 48" measured at the bottom of the berm and 18" measured at the top of the berm.
3. The sand bag berm shall be inspected after each rain. The sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the responsible party and when the silt reaches 6", the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand.

D. SOIL RETENTION BLANKETS

1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Soil retention blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Blankets are used in areas which are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.
2. The soil retention blanket, whether installed as slope protection or as flexible channel liner, shall be placed within 24 hours after seeding or sodding operations have been completed, or as approved by the Engineer. Prior to placing the blanket, the area to be covered shall be relatively free of all rocks or clods over 1-1/2" in maximum dimension and all sticks or other foreign material which will prevent the close contact of the blanket with the soil. The area shall be smooth and free of ruts and other depressions. If as a result of rain, the prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, the Contractor shall be required to rework the soil until it is smooth and to reseed or resod the area at the Contractor's expense.
3. Installation and anchorage of the soil retention blanket shall be in accordance with the manufacturer's recommendations.

E. PROTECTION OF BARE AREAS

1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than 5% or which will be exposed for more than 30 days.
2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets, as determined by the Engineer, such as areas under proposed building slabs, shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "track walked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through the appropriate silt fence system.
4. Protect earth spoil areas by "trackwalking" and silt fences.

F. INTERCEPTOR SWALE

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area.

- The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales should remain in place until the disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6 feet per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 6 inches above the design water surface elevation based on a two year storm.
 3. An interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five (5) acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3 :1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 3%, or velocities exceed 4 feet per second (regardless of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.
 4. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.
 5. The swale shall be excavated or shaped to line, grade, and cross-section as required to meet criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.
 6. All earth removed and not needed in construction shall be disposed of in an approved spoils site so that it will be conveyed to a sediment trapping device.
 7. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device.
 8. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.
 9. Minimum compaction for the swale shall be 90% standard proctor.

G. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. Each silt fence installation shall have a minimum net length (exclusive of embedments into diversion dikes or other ineffective areas) of 25 feet. The runoff from a maximum of one (1) acre of disturbed area or soil stockpile/ spoil area shall be routed through any individual silt fence installation.
2. Install diversion dikes to divert runoff to the silt fence installation.
3. Install silt traps at the inlet (upstream) end of the drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.

4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor from time to time to effectively control erosion and sediment during construction.

3.03 MAINTENANCE

- A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas or return the material to the area from which it eroded.
- B. Upon completion of construction, properly remove the temporary erosion and sediment control structures and complete the area as indicated.
- C. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.04 FIELD QUALITY CONTROL

In the event of conflict between the requirements and storm water pollution control laws, rules or regulations or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

The work as provided for by this specification shall be measured as lump sum or as noted on the bid request. When no line item is included in the Bid Proposal, this work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

4.02 PAYMENT

When shown in the proposal, the work as prescribed for in this specification shall be paid for labor, tools, equipment, excavation, backfilling, materials, and incidentals necessary to complete the work.

END OF SECTION

SECTION 01700 – PROJECT CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK AND RELATED DOCUMENTS

- A. Furnish all work and materials, appliances, tools, equipment, facilities, transportation and services required and incidental thereto, as shown on drawings and/or specified herein including but not limited to; the submittal of closeout documents, final cleaning of materials and equipment and furnishing permit clearances, guarantees and warranties.
- B. Related Work Specified Elsewhere:
 - 1. Submittal Requirements: Section 01300
- C. The completion of the closeout procedures indicated in these specifications will be a condition for releasing final payment.

1.2 PROJECT CLEAN-UP

- A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness. Use only materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material, or as approved by the Engineer/Architect.
- B. Final cleaning shall mean a level of cleanliness generally provided by skilled cleaners using commercial quality, site maintenance equipment and materials.
- C. The Contractor shall schedule a final cleaning as approved by the Engineer/Architect.
- D. The contractor shall restore any disturbed areas or structures to pre- construction conditions or improved conditions.

1.3 ONSITE TRAINING

- A. The Contractor shall provide a demonstration of the operation techniques and methods of the mechanical, electrical and plumbing systems. This demonstration must be coordinated with the Engineer/Architect. The operation and maintenance manuals must be available for use during this training period.
- B. The Contractor shall propose a time in writing to the Engineer/Architect allowing at least seventy-two (72) hours' notice.

1.4 AS BUILT DRAWINGS

- A. Final "As-Built" drawings shall be prepared by the Contractor in an Auto CAD

2005, Micro-station or better format. These drawings shall indicate all changes or deviations from the construction documents. These drawings shall be submitted to the Engineer/Architect on a CD. The drawings must clearly state AS BUILT and be neatly organized.

1.5 GUARANTEES AND WARRANTIES

- A. The Contractor shall provide a construction warranty letter.
- B. The Contractor shall provide final clearances from all permitting agencies.

1.6 FINAL COMPLETION

- A. The Contractor shall supply a written request for a Final Completion inspection. This request shall include the following:
 - 1. Certification that the work and actions specified in the Contract Documents has been completed and that the Owner has full use of the site.
 - 2. All equipment has been tested and balanced and is fully functional.
 - 3. The Onsite Training Program has been completed and there are no outstanding issues resulting from said program.
 - 4. A copy of the list of deficiencies generated by the Substantial Completion inspection, with each item initialed and showing date completed.
 - 5. A list of all Subcontractors and material suppliers with name, address and phone number. Include source for parts replacement and local representative if different.
 - 6. Submit all test/adjust/balance records and start-up performance reports.
 - 7. Submit all tools, keys and any special devices to assure complete operation by the Owner.
 - 8. Final application for payment.
 - 9. Waivers, Sworn Statements and Affidavits of Payments to Subcontractors and Suppliers.

END OF SECTION

SECTION 02101 PREPARATION OF RIGHT-OF-WAY

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. Removal and disposal of all obstructions from the right-of-way and from designated easements for construction operations, by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other items.

- B. Obstructions shall include, but are not limited to:
 - 1. Remains of houses not completely removed by others.
 - 2. Concrete, foundations, floor slabs, curb and gutter, driveways, and sidewalk.
 - 3. Building materials such as brick, lumber and plaster.
 - 4. Water wells, septic tanks, manholes, inlets utility pipes and conduits.
 - 5. Underground service station tanks, equipment or other foundations.
 - 6. Fencing and retaining walls.
 - 7. Paved parking areas.
 - 8. Abandoned railroad tracks, ties, and scrap iron.
 - 9. Ancillary structures such as shacks and outhouses.
 - 10. Trees, stumps, bushes, shrubs, roots, limbs and logs.
 - 11. All rubbish and debris whether above or below ground.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials required to perform work as specified.

PART 3 - EXECUTION

3.01 GENERAL

- A. Clear entire project right-of-way and such other areas, including public or corporate lands, specified in the plans of all structures and obstructions.

- B. Trim carefully all trees and shrubs designated for preservation and protect from scarring or other injuries during construction operation.

- C. Removal of all foundations and underground obstructions, unless otherwise specified, shall be removed to the following depths:
 - 1. In embankment areas, two (2) feet below natural grounds.
 - 2. In excavation areas, two (2) feet below the lower elevation of excavation.
 - 3. In all other areas, one (1) foot below natural grade.
- D. Backfill all holes, as directed by the ENGINEER, resulting from all removals.
- E. Complete the preparation of right-of-way such that prepared right-of-way is free of holes, ditches and other abrupt changes in elevations and irregularities to contours.
- F. Plug the remaining ends of all abandoned storm sewers, culverts, sanitary sewers, conduits and utility pipes with concrete, as specified by the ENGINEER, to form a tight closure.
- G. On existing concrete where only a portion is to be removed, care shall be exercised to avoid damage to remaining concrete. Where concrete reinforcement is encountered in removed portions, a minimum of one (1) foot of such reinforcement shall be cleaned of old concrete and left in place to tie into new construction. Concrete to be preserved, but subsequently destroyed by the CONTRACTOR'S operations, shall be replaced by the CONTRACTOR at his expense in accordance with City Specifications, or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PREPARATION OF RIGHT-OF-WAY

- A. Preparation of right-of-way shall be measured by one of the following methods: on a lump-sum basis; by the acre; or by the linear foot along the centerline of construction (regardless of the width of the right of way). The measurement for payment made only on areas indicated and classified on the plans as preparation of right-of-way.
- B. When not listed as a separate contract pay item, preparation of right-of-way shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02102 CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. Cleaning and grubbing shall consist of the removal of trees, stumps, brush, roots, vegetation, logs, rubbish, railroad rails, railroad ties, abandoned monitoring well and other objectionable matter within the project site limits described in the specifications or as shown on plans.
- B. Cleaning and grubbing shall be done in advance of grading operation. Grubbing may be done simultaneously with excavation, if the cuts are over 3 feet in depth and objectionable matter is removed as specified.
- C. Clearing and Grubbing shall consist of the disposal of all debris resulting from the work specified herein.

1.02 PROTECTION OF ADJACENT WORK:

- A. Provide protection necessary to prevent injury or damage to existing improvements, adjacent property, utilities and other facilities, and trees and plants, indicated to remain in place.
- B. Protect improvements on adjoining properties and all areas outside indicated construction areas from injury or damage.
- C. Restore damaged improvements to their original condition, as acceptable to the Engineer and property owners.
- D. Conduct site clearing and grubbing operations to ensure minimum interference with road, streets, alleys, walks, and other adjacent, occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Provide all required personnel, equipment, and materials required to perform the work as specified.

PART 3 - EXECUTION

3.01 CLEARING:

- A. Clear all areas proposed to be covered by dikes, roads, drainage facilities, curbing, sidewalks, landscaping, structures and embankments within project limits unless otherwise shown in plans.
- B. Remove all saplings, brush, down-timber and debris unless shown or directed otherwise.
- C. Use tree wound paint to treat scars, gashes or limbs stubs on trees not to be removed.

3.02 GRUBBING:

- A. Trees, stumps, root systems, rocks and other obstructions shall be removed to the depths shown when they fall within the construction templates for the following items:

- | | |
|--|--|
| 1. Footings | 18-inches below bottom of footing. |
| 2. Sidewalks (or other types of walks) | 12-inches below bottom of walk. |
| 3. Roadways or | 24-inches below bottom of base material. |
| 4. Parking Areas | 24-inches below bottom of base material. |
| 5. Grasses Areas | 18-inches below bottom top soil. |
| 6. Fills | 24-inches below bottom of fill. |
| 7. Abandoned Utilities | 72-inches below natural ground. |

- B. Blasting not permitted.

3.03 REMOVAL OF DEBRIS AND CLEANUP

- A. Burn as permitted by regulating agencies and the Engineer as work progresses.
- B. Unguarded fires will not be permitted.
- C. Permits will be obtained, where required, for necessary burning or disposal sites.
- D. Dispose of all waste materials not burned by removal from site.
- E. Materials cleared and grubbed shall be the property of the Contractor and shall be his responsibility for disposal.

PART 4 - MEASUREMENT AND PAYMENT

4.01 CLEARING AND GRUBBING:

- A. Clearing and Grubbing shall be measured for payment either in acres or by lump sum only for areas indicated on the plans, or as provided in the proposal and contract.
- B. When not listed as separate contract pay item, Clearing and Grubbing shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor equipment, tools and in incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02103 CONCRETE REMOVAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of breaking up, removing and satisfactorily disposing of existing concrete, as classified, at locations indicated or as directed by the Engineer.
- B. Existing concrete, when under this section, will be classified as follows:
 - 1. Concrete Curb will include curb, curb-and-gutter and valley gutters.
 - 2. Concrete Slabs will include, but not be limited to, patio slabs, porch slabs, foundation systems, riprap and concrete pavement.
 - 3. Sidewalks and Driveways will include concrete sidewalks and driveways.
 - 4. Concrete Walls will include all walls, regardless of height and wall footings.
 - 5. Concrete Steps will include all steps and combinations of walls and steps.
 - 6. Abandoned Foundations will include abandoned utilities foundations.
 - 7. Miscellaneous Concrete shall include, but not be limited to, manholes, inlets, junction boxes and headwalls, as indicated by the plans or the Engineer.

PART 2 PRODUCTS

2.01 MORTAR:

- A. Mortar, for repair of existing concrete structures, shall conform to the requirements thereof in Section 3300 - Cast-In-Place Concrete.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. Prior to commencing this work, all erosion control and tree protection measures required shall be in place and all utilities located and protected. The existing concrete shall be broken up, removed in accordance with Section 2101 - "Preparation of Right-of-Way", and disposed of at a permitted disposal site by the Contractor.
- B. Where only a portion of the existing concrete is to be removed and the remaining portion is to continue to serve its purpose, care shall be exercised to avoid damage to the portion that will remain in place.
- C. The existing concrete shall be cut along neat lines when indicated, or as

established by the Engineer, by sawing with an appropriate type circular concrete saw to a minimum depth of 1/2 inch.

- D. Any reinforcing steel encountered shall be cut off 1 inch inside of the concrete sawed line. Any existing concrete which is damaged or destroyed beyond the neat lines so established, shall be replaced at the Contractor's expense.
- E. The remaining concrete shall be grouted and / or sealed to protect the reinforcing steel while providing a neat, clean appearance.
- F. When applicable, a minimum of 1 foot of steel length shall be cleaned of all old concrete and left in place to tie into the new construction when reinforcement is encountered in the removed portions of structures to be modified.
- G. All unsuitable material shall be removed and replaced with approved material.
- H. All foundation, walls or other objectionable material shall be removed to a minimum depth of 18 inches below all structures and 12 inches below areas to be vegetated.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Concrete curb when removed as prescribed above, will be measured by the linear foot, in its original position, regardless of the dimensions or size.
- B. Concrete slabs and concrete sidewalks and driveways removed as prescribed above will be measured by the square foot or square yard in original position, regardless of the thickness and reinforcing.
- C. Concrete steps removed will be measured per linear foot or square foot of each individual step tread including the bottom step.
- D. Concrete foundation removed will be measured per square yard.
- E. Miscellaneous concrete removed will be measured per square yard each.

4.02 PAYMENT:

- A. This item will be paid for at the contract unit price bid for "Removed Concrete Curb", "Removed Concrete Slab", "Remove Concrete Sidewalks and Driveways", "Removed Concrete Foundations" and "Remove Miscellaneous Concrete", which price shall be full compensation for all work herein specified, including the disposal of all material not required in the work, the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the work.

- B. When not listed as a separate contract pay item, removal of concrete shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work, will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02210 GRADING AND EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Grading and earthwork which occurs in areas other than under structures, under paving, or trenching for utilities.
- B. Earthwork consists of operations required for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural or improved sub-grades: finish grading; disposal of excess or unsuitable materials; and other required operations. Earthwork shall conform with dimensions and typical sections shown, and within lines and grades established on Drawings.

1.2 RELATED SECTIONS:

- A. Trenching, structure excavation, backfilling and grading - Section 02221. B. Excavating, backfilling and compacting for utilities - Section 02227.

1.3 REFERENCES:

- A. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³).
- B. ASTM D4972 - pH of Soil.
- C. ASTM G57 - Field Measurement of Soil Resistivity Using the Wenner Four Electrode Method.
- D. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 EXISTING UTILITIES:

- A. Where pipes, ducts and structures are encountered in the excavation but are not shown on the Drawings, immediately notify the ENGINEER.

1.5 DEFINITIONS:

- A. Classification: Earthwork materials are classified in accordance with definitions in this Article.
- B. Topsoil: Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes roots and other vegetation.

- C. General Site Fill: Suitable, clean material excavated on-site or off-site may be used as fill material. Suitable material shall consist of clay soils classified as CH according to the unified soil classification system. Clay soil used as fill shall have a liquid limit of less than 55 and a Plasticity Index comparable with on-site soils.
- D. Select Fill: Select fill material, as required for construction, defined in the plans and/or Sections 02221 and 02227, shall consist of inorganic silty or sandy clay.
- E. Subgrade: Consists of that portion of the surface on which a compacted fill, backfill or topsoil is placed.
- F. Borrow: Material taken from on-site designated areas or approved off-site sources to make up any deficit of excavated material. Obtain from area that is normally dry and well drained. Borrow does not include top soil.
- G. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.
- H. Excavation: Excavation of every description and of whatever substances encountered within the limits of the project to the lines and grades indicated on the Drawings.
- I. Compaction: Compaction of soil materials shall be measured as a percent of Standard Proctor density as determined by the ASTM D698.

PART 2 - PRODUCTS

2.1 SELECT FILL:

- A. Source: Obtain select fill material from required excavation, or if excavated material is not adequate, from borrow areas approved by the ENGINEER. Material from source shall be tested for compliance with project requirements and approved by the Owner and Testing Laboratory.
- B. Suitability: Use the best material available from excavation or borrow, suitability of select fill is subject to the ENGINEER'S approval.
- C. Quality: Select fill material must be free of rock and clay lumps or excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.
- D. Characteristics: Select fill material shall consist of inorganic silty or sandy clay. Additional select fill requirements are described in Sections 02227.

2.2 FILL AND BACKFILL UNDER TOPSOIL:

- A. Source: Obtain site fill from required excavation or, if excavated material is not sufficient, from borrow areas approved by the ENGINEER.
- B. Suitability: Use the best material available from excavation or borrow. Suitability of fill material is subject to the Testing Laboratory\Engineer's approval.
- C. Quality: Fill material shall be free of excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.
- D. Characteristics: Fill material shall have a plasticity index between 6 and 25, inclusive, and shall generally be of similar character to that of existing soil at the site.

PART 3 – EXECUTION

3.1 STRIP AND STOCKPILE:

- A. Remove topsoil at all non –paved areas where excavation of topsoil is required or where fill material will be added for site grading. Remove top 6 inches of topsoil where necessary and stockpile on the property as directed by the Owner. Protect stockpiled topsoil from other excavated materials, dumping of unwanted material, dumping by the public, and erosion. Upon completion of rough grading, replace topsoil in 4-inch minimum layer to finish grade elevations as shown on the grading plan.
- B. Removal of topsoil in building areas and paving areas is further described under provisions of Section 02227.

3.2 EXCAVATION:

- A. Objective: As shown on the Drawings, excavate to lines, grades and elevations required for subsequent construction. All excavation shall be made in such manner as to permit all surfaces to be brought to final line and grade within plus or minus 0.1 foot. Over excavation shall be restored by the Contractor at his own expense. Finished grades consistently high or low will not be acceptable and shall be corrected by the Contractor at his expense and no additional cost to the Owner.
- B. Drainage: During excavation, maintain grades as required to provide positive drainage away from structures; or, as directed by the Engineer, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling: If, at time of excavation, it is not possible to place material in the proper section of permanent construction, CONTRACTOR shall stockpile the material in Owner or Architect approved areas for later use.

- D. Stone or Rock: Stone or rock fragments greater than 6" will not be allowed in fills or embankments. Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing: Uniformly dress, cut and fill slopes to slope, cross section and alignment, as shown.

3.3 TREATMENT OF SUBGRADES:

- A. All topsoil and vegetation shall be stripped from the ground surface and stockpiled, exposing sound undisturbed subgrade soils.
- B. After stripping the topsoil in areas to receive fill or cut areas, the exposed ground surface shall be scarified to a depth of 6 inches, the moisture adjusted, and then re-compact to a minimum density of 95 percent of the maximum density as obtained in the Standard Proctor Compaction Test (ASTM D698), at a moisture content between minus 1 to plus 3 percent of optimum. Any soft or compressible areas detected during the re-compaction process shall be undercut such that sound subgrade soils are exposed and re-compacted. Site excavated or select fill shall then be used to bring all areas to grade. Allow for placement of minimum 4-inch layer of top soil in areas not covered by building or pavement.
- C. Finished subgrade shall be inspected by Testing Laboratory for determination that subgrade meets requirements of Contract Documents.

3.4 PLACING FILL AND BACKFILL:

- A. Examination of Subgrade: Do not place fill on any part of the subgrade until the subgrade preparation has been accepted by the Engineer.
- B. Removing Debris: During the dumping and spreading process, remove all roots, stones and debris that are uncovered in the fill material.
- C. Spreading Fill and Backfill: After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction shall not exceed 8 inches unless otherwise directed by the Engineer. Maintain positive drainage throughout construction. The combined excavation and fill placing operation shall be such that the material when compacted in the fill will be blended sufficiently to secure the best practicable degree of compaction. The suitability of the materials shall be subject to testing by the Testing Laboratory and approval of the Engineer. After each layer of fill has been spread to the proper depth, it shall be thoroughly manipulated with a disc plow or other suitable and approved equipment until the material is uniformly mixed, pulverized and brought to uniform approved moisture content.
- D. Attaining Proper Bond: If, in the opinion of the Testing Laboratory, the compacted

surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

- E. Place materials to proper elevation allowing for depth of topsoil furnished under this Contract.

3.5 MOISTURE CONTROL:

- A. Intent: Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content shall not vary from the optimum, as determined by ASTM D698, by more than minus 1 to plus 3 percent of optimum.
- B. Adjustment: If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other Engineer approved method.

3.6 COMPACTION:

- A. Rough Grade: Compact each layer of fill material with suitable equipment as necessary to secure 95% to 98% Standard Proctor Density (ASTM D698) within the specified range of the moisture content.
- B. Finish Grade: Place and lightly compact topsoil to achieve finish grades.

3.7 DISTRIBUTION OF TOPSOIL:

- A. Perform rough grading and topsoil/finish grading work.
- B. Preparation:
 - 1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade.
 - 2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil
- C. Placement:
 - 1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
 - 2. Distribute topsoil uniformly and spread evenly. Correct irregularities in the surface to prevent formation of depressions where water could stand.
 - 3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth and suitable for lawn planting.

4. Lightly compact topsoil to obtain proper bond with previously placed or prepared material.

D. Maintenance: Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

3.8 MATERIAL DISPOSAL:

A. Excess Excavation Material (soil material free of trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has been accepted by the Geotechnical Engineer): Remove excess excavated material from the construction site or place on the property as directed by the ENGINEER.

B. Waste Material (soil material including trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has not been accepted by the Geotechnical Engineer): Remove waste material from the project site before Final Inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

PART 4 - TESTING

A. The testing laboratory will make tests of in-place density in accordance with ASTM Standards. Backfill operations will be monitored continuously by the testing laboratory at structures. It will be the responsibility of the CONTRACTOR to notify the testing laboratory before backfill operations begin.

PART 5 - MEASUREMENT AND PAYMENT

A. No separate payment shall be made to the CONTRACTOR for the work described in this Section. Such work shall be considered incidental to the project and the payments made under specific Pay Items shall be considered as full compensation for these requirements.

END OF SECTION

SECTION 02220 SUBGRADE PREPARATION

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of scarifying, blading and rolling the sub-grade to obtain a uniform texture and provide as nearly as practical a uniform density for the 6 inches of the sub-grade.

PART 2 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. All preparing of the right-of-way and/or clearing and grubbing shall be completed before starting the sub-grade preparation.
- B. The sub-grade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated or as established by the ENGINEER by the removal of existing material or addition of approved material.
- C. All unsuitable material shall be removed and replaced with approved material.
- D. All foundations, walls or other objectionable material shall be removed to a minimum depth of 18-inches under all structures and 12-inches under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material.
- E. The surface of the sub-grade shall be finished to the lines and grades as established and be in conformity with the typical sections indicated.
- F. Any deviation in excess of ½ inch cross section and in a length of 10 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and compacting by sprinkling and rolling.
- G. Sufficient sub-grade shall be prepared in advance to insure satisfactory prosecution of the work.
- H. The CONTRACTOR will be required to set blue tops for the sub-grade on centerline, at quarter points and curb lines or edge of pavement at intervals not exceeding 50 feet.
- I. All suitable material removed may be utilized in the sub-grade with the approval of the ENGINEER. All other material required for completion of the sub-grade shall also be subject to approval by the ENGINEER.

- J. Sub-grade materials on which structures shall be placed shall be compacted by approved mechanical tamping equipment to a dry density of the total material of not less than 95 percent nor more than 100 percent of the maximum dry density as determined in accordance with SDHPT Test Method Tex-114-E.
- K. Sub-grade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the maximum dry density as determined in accordance with SDHPT Test Method Tex-114-E.
- L. Tests for density will be made as soon as possible after compacting operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.
- M. Just prior to placing any base materials, density and moisture content of the top 6 inches of compacted sub-grade shall be checked and if tests show the density to be more than 2 percent below the specified minimum or the moisture content to be more than 3 percent above or below the optimum, the sub-grade shall be reworked as necessary to obtain the specified compaction and moisture content.
- N. Proof Rolling is required before placing base material in conformity with Item 02686 "Proof Rolling".
- O. When lime stabilization of the sub-grade is specified, the lime is to be added in accordance with Section 02240, Lime Stabilization.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. All acceptable sub-grade preparation will be measured by the square yard.
- B. The measured area includes the entire width of the roadway for the entire length as indicated.

4.02 PAYMENT:

- A. The accepted quantities of sub-grade preparation will be paid for at contract unit bid price per square yard.
- B. When not listed as a separate contract pay item, sub-grade preparation shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02221 TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. Excavation, shoring, dewatering, pipe bedding, trench backfill, compaction, grading and cleanup of all pipeline trenching.
- B. All work must be performed in accordance with these specifications and the safety requirements of the State and OSHA standards.

1.02 JOB CONDITIONS

A. Site Acceptance

- 1. Contractor shall accept the site conditions existing during the Contract Time.
- 2. Ground water and surface water are conditions of the contract and the responsibility of Contractor.

B. Adverse Weather

- 1. Place no backfill that is wet or frozen.
- 2. Place no backfill in wet or frozen trenches.

PART 2 - PRODUCTS

2.01 PIPE BEDDING AND BACKFILL

The types of material to be used for bedding and backfill are identified on the Drawings or in the Special Provisions of the contract documents. Material types are defined either by class in accordance with ASTM D2321, or by product description. Contractor is responsible for determination of source of materials and shall submit characterization analysis and physical sample of proposed bedding material for approval prior to construction.

- A. Class Designations Based on Laboratory Testing (ASTM D2321 and by reference ASTM D2487 and D653).
 - 1. Class IA: Manufactured aggregates (angular crushed rock/gravel), open-graded, clean.
 - a. Plasticity Index: Non-plastic.
 - b. Gradation: 100% passing 1½" sieve, ≤ 10% passing No. 4 sieve, and <5% passing No. 200 sieve.
 - 2. Class IB: Mixture of manufactured aggregates (Class 1A) and sand, dense-graded, clean.
 - a. Plasticity Index: Non-plastic.
 - b. Gradation: 100% passing 1½" sieve, ≤ 50% passing No. 4 sieve, and <5%

- passing No. 200 sieve.
3. Class II: Well and poorly graded gravels and sands, clean or with little to moderate fines (silt and clay).
 - a. Plasticity Index: Non-plastic.
 - b. Gravel: 100% passing 1½" sieve, < 5% passing No. 200 sieve (i.e. <5% fines), and < 50% of the non-fines passing a No. 4 sieve.
 - c. Sand: 100% passing 1½" sieve, < 5% passing No. 200 sieve (i.e. <5% fines), and > 50% of the non-fines passing a No. 4 sieve.
 - d. Gravel, Sand with Fines: 100% passing 1½" sieve, and 5% to 12% passing No. 200 sieve (i.e. 5% to 12% fines).
 4. Class III: Silty/clayey gravels and sands, gravel-sand-silt/clay mixtures.
 - a. Plasticity Index: (Refer to ASTM D2321)
 - b. Gradation: 100% passing 1½" sieve, 12% to 50% passing No. 200 sieve.

*Note: Dense-graded (i.e. well graded) and open-graded (i.e. poorly graded) materials are defined on the basis of the coefficient of uniformity, $C_u = D_{60}/D_{10}$, and the coefficient of curvature, $C_c = (D_{30})^2/(D_{10} \times D_{60})$, where D_{60} , D_{30} , and D_{10} represent the sieve opening dimensions through which 60%, 30%, and 10% of the material would pass, respectively:

Dense-graded: $1 \leq C_c \leq 3$ for gravel and sand, plus $C_u \geq 4$ for gravel; $C_u \geq 6$ for sand.

Open-graded: Either C_c or C_u criteria for dense gradation are not met.

B. Designations Based on Product Descriptions:

1. Excavated Material Backfill: Excavated material may be used in the trench backfill, provided that all hard rock and stones having any dimensions greater than 6" and frozen earth, debris and roots larger than 2" are removed for the initial backfill. Plasticity Index shall be less than 30. Excavated backfill material must be approved by Engineer.
2. Select Backfill: Select Backfill shall be gravel, fine rock cuttings, sand, sandy loam or loam free from excessive clay. Rock cuttings shall have no dimensions greater than 2 inches. Plasticity Index shall be between 7 and 22. Select backfill must be approved by Engineer.
3. Sand Backfill: Sand backfill shall be clean, hard, durable, uncoated grains, free from lumps and organic material. All materials must pass a No. 8 sieve with less than 5% passing a No. 200 sieve (equivalent to ASTM 2321 Class II Sand Gradation excluding material captured on No. 8 sieve).
4. Granular Backfill: Granular backfill shall be free flowing, such as sand or hydraulically graded stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over 2 inches in diameter, clay and organic matter.
5. Controlled Density Fill: Use high slump mixture of Portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal. Provide mixture having 28-day compressive strength of 70 psi minimum and 150 psi maximum with no measurable shrinkage or surface settlement.

2.02 CRADLING ROCK

- A. Use crushed rock or stone with 70-100% passing 1½ inch sieve and no more than 50% passing 1 inch sieve.

2.03 GEOTEXTILE MATERIAL FOR UNSTABLE TRENCHES

- A. Where unstable wall or trench bottom conditions are present as determined by the Engineer, a geotextile material shall be installed.
- B. The geotextile shall be designed to prevent loss of trench support caused by migration of sand and fines into the embedment matrix and secure the embedment around the pipe.
- C. The geotextile shall be a nonwoven, needle point construction and shall consist of long-chain polyethylene or polyamide. The fibers shall be oriented into a stable network whereby they retain their positions with each other. The textile shall be free of any chemical treatment commonly found in soil. The geotextile shall conform to the following properties:

Tensile Strength: ASTM D 4632	130 LBS	
Elongation: ASTM D 4632	50%	
Mullen Burst Strength: ASTM D 3786	250 psi	
Coefficient of Permeability: K-cm/sec. (20 CFMC-GET-2, Constant Head) ASTM D 4491	0.10cm/sec.	
Puncture Strength:	80	LBS.

- D. The geotextile shall be furnished in protective wrapping to protect the material from ultraviolet radiation, contamination from other substances, and abrasion or shipping damage. Any material received damaged, shall be rejected.

PART 3 - EXECUTION

3.01 GENERAL

A. Dewatering

1. Execute work "dry". No pipe or conduits shall be laid or concrete poured on wet soil.
2. Prevent surface water from flowing into excavation.
3. Provide equipment for handling water encountered as required. Obtain Engineer's prior approval of proposed method of dewatering.
4. No sanitary sewer shall be used for disposal of trench water.

B. Protection of Existing Utilities

1. Notify all utility companies of location and schedule of work.
2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility companies and Engineer of conflicts between existing and proposed facilities.
3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractor's expense.

C. Sheet piling, Shoring and Bracing

1. All sheet piling, shoring, and bracing shall be in accordance with the Contractor's Excavation Safety System Plan and the safety requirements of the State and OSHA Standards.
2. Provide as necessary to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
3. Leave Sheet piling and shoring in place where removal might cause personal injury or damage to the work.
4. When movable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

D. Changes in Grade

1. Grades may be adjusted by written field order from the Engineer to suit unforeseen construction conflicts or conditions. Where the bid includes a single bid price for all depths, no additional compensation will be made for adjustments within 1.5 feet of the plan grades.

3.02 EXCAVATION AND TRENCHING

A. General

1. Method of excavation is Contractor's option.
2. Allow no more than 300 feet of trench to be open at one time.
3. Excavate by hand under and around structures, utilities, and roots of trees required to be left in place.
4. Stockpile and replace topsoil to a minimum of 8 inches for surface restoration in grassed or agricultural areas.

B. Trench Characteristics

1. Depth: As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified.
2. Width: Trench width shall be no less than pipe O.D. plus 16 inches or pipe O.D. $\times 1.25 + 12$ inches, whichever is greater.
3. Trench walls must be vertical below top of pipe and may be vertical or sloped above pipe to conform to excavation codes.
4. Trench boxes and shoring shall not be set below the top of the embedment zone.
5. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
6. Trench bottom shall be free of large stones and other foreign material.

3.03 SOFT, SPONGY OR UNSTABLE MATERIALS (e.g. peat, muck, and highly expansive soils)

- A. Stop work and notify Engineer.
- B. Perform remedial work as directed.
- C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.04 ROCK EXCAVATION

- A. Excavate any rock to maintain minimum 6-inch clearance around pipe.
- B. Dispose of rock material not suitable for backfill as directed by Engineer.
- C. Use of explosives not permitted without prior written authorization from Owner and Engineer.
- D. Provide Special Hazard Insurance covering liability for blasting operations.

3.05 PIPE EMBEDMENT

Pipe embedment includes materials placed in the zone surrounding the pipe including bedding, haunching, and initial backfill over the top of pipe. Refer to the pipe bedding details on the Drawings for material types to be used in the pipe embedment zone.

A. Bedding

1. Place after bottom of trench has been excavated to proper depth and grade.
2. Place, compact and shape bedding material to conform to barrel of pipe and bell to insure continuous firm bedding for full length of pipe.

B. Haunching (bottom of pipe to springline)

1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
2. Do not backfill until any required concrete or mortar has sufficiently cured.
3. Work bedding material under pipe haunches and compact by hand to springline of pipe in 6-inch lifts.

C. Initial Backfill

1. From springline to not less than 12 inches above top of pipe, place backfill and compact in 6-inch layers using vibratory compactors.
2. Backfill simultaneously on both sides of pipe to prevent displacement.
3. Record location of connections and appurtenances before backfilling.

D. Embedment in Unstable Soils

1. Where the Engineer determines that the trench bottom or wall is unstable at the bedding zone, special pipe embedment material stabilization shall be required.
2. Unstable bedding zone conditions shall be determined immediately after trench excavation by checking soil bearing strength capacities at the bedding zone using a Standard Pocket Penetrometer or other appropriate means. A minimum of three readings shall be obtained and averaged. The soil to be tested in the bedding zone shall not be allowed to dry, and shall be tested under "in-situ" conditions. If, in the Engineer's opinion, the soil has dried, the Penetrometer Test shall be taken after removing a sufficient amount of soil from the wall or bottom surface in order to obtain a representative sample.
3. If the average reading is less than 8 blows per foot, then the pipe bed shall be prepared as follows:
 - a. The trench shall be dewatered to the greatest extent possible and rock shall be placed and compacted to form a firm trench bottom. No pipe shall be laid until stabilization is to the satisfaction of the Engineer.

- b. A geotextile material shall be placed in the trench and the embedment material and pipe installed as indicated on the Drawings. Overlap geotextile around the top of the pipe envelope a minimum of 12 inches.
 - c. The geotextile shall be installed in accordance with the manufacturer's recommendations. Prior to installation, the geotextile shall be stretched, aligned, and placed without any wrinkles. If the material is damaged or punctured, the damaged area shall be patched by overlapping and stitching.
 4. Where the trench wall is unable to support trench boxes at a level above the top of the embedment zone, sheeting shall be used for trench wall stabilization to enable such use of trench boxes or as stand-alone trench protection in lieu of trench boxes. Sheeting installed below the top of the embedment zone shall be extracted vertically in incremental steps of one (1) foot or less. Embedment material shall be placed in loose lifts before each extraction step and thoroughly compacted immediately after each step to ensure that no compacted lift is disturbed by subsequent extraction. Contractor shall ensure the soils of the trench walls on both sides of the embedment zone remain as dense as the original unexcavated condition so that the pipe embedment remains firmly supported. In no case shall a trench box be permitted to rest below the top of the embedment zone.

E. Embedment of Flexible Pipe in Saturated Soils (Sewer Pipe Only)

1. Consolidated Soils: Pipe embedment may be installed using least restrictive, open-graded material.
2. Unconsolidated, Stable Soils: Dense-graded material shall be used to prevent loss of trench support caused by migration of soil into the embedment matrix. Alternately, open-graded embedment may be used in combination with geotextile fabric as specified for unstable soil.

3.06 TRENCH BACKFILL

A. Final Backfill

1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
2. Compaction of all backfill material shall be performed in a manner that shall not crack, crush, or cause the installed pipe to be moved from the established grade and alignment.
3. Place minimum cushion of 3 feet of compacted backfill above pipe envelope before using heavy compacting equipment.
4. Use excavated material for final backfill subject to the requirements for Excavated Backfill, unless otherwise specified.
5. Areas under or within 5 feet of pavement, and under or within 2 feet of utilities, buildings, or walks shall be backfilled with sand and mechanically compacted to the top of the subgrade in 8-inch lifts to a minimum of 95%

Standard Proctor Density.

6. Areas not subject to vehicular traffic shall be backfilled in layers not more than 12 inches.
7. Structural and non-structural backfill shall be mechanically compacted. Compaction method is at discretion of Contractor with following exceptions:
 - a. If in Owner's opinion compaction method presents potential damage to pipe, it will not be allowed.
 - b. Flooding or water jetting may be permitted only if a geotechnical report justifying the use of water jetting is submitted to the City Engineer and approval is granted.
8. Mound excavated materials no greater than 6 inches in open areas only.
9. Fill upper portion of trench with topsoil as specified hereinbefore.

B. Controlled Density Fill

1. Use where shown on plans.
2. Provide suitable forms to limit volume of control density fill material.
3. Prevent flow of material into existing drain lines.
4. Protect exposed utility lines during placement.
5. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer.

3.07 EXCESS MATERIAL

- A. Disposal of excess excavated material shall be the responsibility of the Contractor.

3.08 TESTING

- A. Unless specified elsewhere, testing will be responsibility of Owner.

B. Standard Proctor Density

1. ASTM D698.
2. One (1) required for each type of material encountered.

C. In Place Density

1. ASTM D1556 (Sand Cone)
2. ASTM D2167 (Balloon)
3. ASTM D3017 (Nuclear)

- D. One (1) test per 250 linear feet of trench on alternating lifts, with a minimum of three tests per visit, for non-structural areas. One (1) test per 100 linear feet of trench on alternating lifts, with a minimum of three tests per visit, for structural areas.

- E. Contractor will be responsible for any costs associated with testing performed as a result of failed tests

PART 4 - MEASUREMENT AND PAYMENT

4.01 TRENCH EXCAVATION

- A. Trench excavation shall be considered incidental to pipeline installation.
- B. Payment shall be made at the contract unit price per cubic yard only if a bid item is established in the contract.

4.02 BACKFILL

- A. Backfill shall be considered incidental to pipeline installation.
- B. Payment for backfill shall be made at the contract unit price per cubic yard only if a separate bid item is established in the contract.
- C. No allowance for waste shall be made.
- D. If Engineer orders bedding backfill material other than that specified in contract, it shall be paid for as an extra in price per cubic yard as compacted in place, EXCEPT if a higher class embedment is ordered by Engineer because the Contractor has over-excavated the trench.
- E. If the Engineer orders the excavated material to be removed and disposed of and replaced with another material and a separate bid item for that material has not been established, the material shall be paid as an extra.
- F. If the Contractor fails to compact the backfill to the density requirements, the Engineer may order the material removed and replaced at no cost to the Owner.
- G. The disposal of rejected material shall be at no cost to the Owner.
- H. Payment for geotextile envelopment in unstable trench soils shall be made at the bid price for "Trench Stabilization in Unstable Soils" in the bid form.

END OF SECTION

SECTION 02223 TRENCH EXCAVATION PROTECTION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of shoring, bracing, bank stabilization, bank sloping, providing trench boxes or trench shields or other equivalent means to protect employees from the effects of moving ground or cave-ins.
- B. These specifications apply to any trench excavation which is over five (5) feet in depth from the ground surface, or trench excavations that are less than five (5) feet in depth located in areas where unstable soil conditions are present (Ref. OSHA Safety and Health Regulations, Part 1926, Subpart P, Paragraph 29 CFR 1926.652, Subparagraph (a)).
- C. All work shall be done in conformance with OSHA Safety and Health Standards (29 CFR 1926/1010 Chapter XVII Subpart P-Excavations, Trenching and Shoring.). It is the Contractor's responsibility that all excavation work and site conditions are within the regulations as established by OSHA. Any property damage or bodily injury (including death) that arises from use of the trench safety systems, from the Contractor's negligence in performance of the contract work, shall remain the sole responsibility and liability of the Contractor.

1.02 DEFINITIONS APPLICABLE TO THIS SPECIFICATION

- A. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required a Registered Professional Engineer, or other duly licensed or recognized authority.
- B. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.
- C. "Bank" - A mass of soil rising above a digging level.
- D. "Belled excavation" - A part of shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.
- E. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.
- F. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms

or similar structures reduce the depth-to-width relationship, an excavation may become a trench.

- G. "Faces" - See paragraph (K) of this section.
- H. "Hard compact soil" - All earth materials not classified as running or unstable.
- I. "Kickouts" - Accidental release or failure of a shore or brace.
- J. "Sheet pile" - A pile, or sheeting, that may form one of the continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
- K. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.
- L. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
- M. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.
- N. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15-feet.
- O. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.
- P. "Unstable soil" - Earth material, other than running, that because of its nature of the influence of related conditions cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.
- Q. "Uprights" - the vertical members of a shoring system.
- R. "Wales" - See paragraph M of this section.
- S. "Walls" - See paragraph K of this section.

PART 2 - PRODUCTS

No information for this section

PART 3 - EXECUTION

3.01 GENERAL PROTECTION REQUIREMENTS

- A. Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.
- B. If planks are used for raised walkways, runways, or sidewalks they shall be laid parallel to the length of the walk and fastened together against displacement.
- C. Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.
- D. Raised walkways, runways, and sidewalks shall be provided with plank steps on string stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.
- E. All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet and other parts of the body as set forth in OSHA Standards.
- F. Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made or reflectorized with high visibility material.
- G. Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in OSHA Standards.
- H. No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage, employees shall be required to stand away from any vehicle being loaded.
- I. Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard employees.

3.02 SPECIFIC EXCAVATION REQUIREMENTS

- A. Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, telephone, water, fuel, electric lines,

- etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.
- B. Trees, boulders, and other surface encumbrances, located so as to create a hazard employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
 - C. The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground or some other equivalent means.
 - D. Excavations shall be inspected by a competent person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
 - E. The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying materials, or stored material; and vibration from equipment, blasting, traffic, or other sources.
 - F. Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.
 - G. All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.
 - H. The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion deep frost action and slide planes appear.
 - I. Clearances:

1. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2-feet or more from the edge of the excavation.
 2. As an alternative to the clearance prescribed in subparagraph 1, the Contractor may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.
- J. Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.
- K. Support systems shall be planned and designed by a qualified person when excavation is in excess of 20-feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.
- L. Materials used for sheeting, sheet piling, cribbing, bracing, shoring and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.
- M. Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to previously backfilled excavation for a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.
- N. Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.
- O. If the stability of adjoining building or walls is endangered by excavations, shoring, bracing or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person the protection effectively maintained.
- P. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

- Q. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.
- R. Blasting and the use of explosives are not allowed unless authorized in other portions of the specifications.
- S. When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.
- T. Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc. shall be backfilled.
- U. If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.
- V. In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in OSHA Standards shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc. shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.
- W. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- X. Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.
- Y. All ladders used on excavation operations shall be in accordance with requirements of OSHA Standards.

3.03 SPECIFIC TRENCHING REQUIREMENTS

- A. Banks more than 5-feet shall be shored, laid back to a stable slope or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Figure 19000-1 as a guide in sloping of banks. Trenches less than 5-feet in depth shall also be

effectively protected when examination of the ground indicates hazardous ground movement may be expected.

- B. Sides of trenches in unstable or soft material, 5-feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Figure 19000-1 and Table 19000-1.
- C. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5-feet in depth and 8-feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level may be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6-feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.
- D. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
- E. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.
- F. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier and securely fastened to shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.
- G. Minimum requirements for trench timbering shall be in accordance with Table 19000-1. Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stresses in excess of values given by the following formula:

$$S + 1300 - \frac{20L}{D}$$

$$\text{Maximum Ratio} \quad \frac{L}{D} = 50$$

Where:

- L = Length, unsupported, inches
- D = Least side of the timber in inches
- S = Allowable stress in pounds per square inch of cross-section.

- H. When employees are required to be in trenches 4-feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25-feet of lateral travel.
- I. Bracing or shoring of trenches shall be carried along with the excavation.
- J. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically and be secured to prevent sliding, falling, or kickouts.
- K. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench. The Contractor shall provide a statement certified by a Registered Professional Engineer of the adequacy of trench boxes or shields.
- L. Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.
- M. The Contractor's trench safety system shall be designed to take into account all surcharge loads including, but not limited to adjacent structures, contractor's equipment and heavily loaded truck traffic which will be routed near the work site.

3.05 CONSTRUCTION REQUIREMENTS

- A. The Contractor unless provided for in the plans otherwise shall provide the minimum shoring shown in Table 02223-1 for the soil class noted in the plans. If approved by the Engineer, the Contractor may slope the excavation in accordance with Table 02223-1
- B. Should the soil conditions differ from those specified or should ground water be encountered in the excavation the contractor shall notify the Engineer immediately. The Contractor shall refrain from operating in that portion of the trench where changed conditions are noted until such time as an inspection of conditions takes place and the contractor is notified of measures necessary for continued operation.

- C. The Contractor shall prepare and submit a plan of operation. This plan of operation shall identify material, equipment, methods and installation and shall be inspected by a Registered Professional Engineer. The Contractor's Engineer shall certify the adequacy of the trench protection system and its adherence of OSHA Standards.

PART 4- MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Providing shoring in trenches or other alternate means in accordance with this specification shall be measured by the linear foot of trench irrespective of size of pipe or depth or lump sum as shown or implied in the plans, or as provided in the proposal and contract. Additional depth for foundations, etc. shall be considered incidental to the price bid for the protection.
- B. If the plans require sloping the excavation or the excavation is sloped in accordance with Figure 19000-1 after receiving permission from the Engineer, no payment will be made under this item.
- C. The Contractor shall provide shoring systems for construction of structures 5-feet or greater in depth. There will be no direct payment for these systems but it shall be considered incidental to the price bid for the structure.

4.02 PAYMENT

- A. Payment shall be made at the unit price bid for "Trench Excavation Protection" and include all components for design and construction of the Trench Protection System which can include, but not be limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage. Payment shall also include the additional excavation and backfill required, any jacking, jack removal, and removal of the trench supports after completion.
- B. When not listed as separate contract pay item, Trench Excavation Protection shall be considered as incidental work, and the cost thereof including furnishing all materials, labor equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications, shall be incorporated in such contract pay items as are provided in the proposal contract.

END OF SECTION

TABLE 02223-1 TRENCH SHORING MINIMUM REQUIREMENTS

		Size and Spacing of										
Depth Of Trench Feet	Kind or Condition of Earth	Uprights		Stringers		Cross Braces		Width of Trench		Maximum Spacing		
		Minimum Dimension Inches	Maximum Spacing Feet	Minimum Dimension Inches	Maximum Spacing Feet	Up to 3 Feet Inches	3-6 Feet Inches	6-9 Feet Inches	9-12 Feet Inches	12-15 Feet Inches	Vertical Feet	Horizontal Feet
5 to 10	Hard, Compact	3 x 4 or 2 x 6	6	---	---	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Hydrostatic Pressure	3 x 4 or 2 x 6	Close Sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
10-15	Hard, Compact	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	-	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
	Hydrostatic Pressure	3 x 6	Close Sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
15-20	All Kinds of Conditions	3 x 6	Close Sheeting	4 x 12	4	4 x 12	6 x 8	8 x 8	8 x 10	10 x 10	4	6
Over 20	All Kinds of Conditions	3 x 6	Close Sheeting	6 x 8	4	4 x 12	8 x 8	8 x 10	10 x 12	10 x 12	4	6

Trench jacks may be used in lieu of, or in combination with cross braces

Shoring is not required in solid rock, hard shale or hard slag.

Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

02224 – BORING AND JACKING

1.00 GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to install pipe or box by jacking, boring or tunneling. This section shall govern for jacking, boring or tunneling of casing pipe or box in performing the construction of water and sewer lines.

1.02 QUALITY ASSURANCE [Not Used]

1.03 SUBMITTALS

Submittals shall be in accordance with Section 01300, SUBMITTALS and shall include:

1. Proposed material list and sources
2. Shop drawing for casing pipe showing sizes and hold down assemblies or casing spacers for carrier pipe.
3. Working drawings and written procedures describing in detail proposed bore and jack method an entire operation to be used, for information only, including but not limited to:
 - a. Working and receiving shafts;
 - b. Dewatering;
 - c. Method of removing soils and installation of casing and carrier pipe;
 - d. Size, capacity and arrangement of equipment;
 - e. Backstop;
 - f. Shaft base material;
 - g. Type of cutter head;
 - h. Method of monitoring and controlling line and grade;
 - i. Detection of surface movement;
 - j. Procedures for installing pipe supports, anchors, or placement of grout between carrier pipe and casing pipe;
 - k. Bulkhead details and proposed positive method of anchoring pipe to prevent flotation;
 - l. Catalog data for casing spacers when used for temporary support during construction;
 - m. Procedure for monitoring line and grade;

1.06 STANDARDS

The applicable provisions of the following standards shall apply as if written here in their entirety:

Follow applicable ordinances, codes, statutes, rules, and regulations of the State of Texas, applicable County building codes, affected Railroad Company and Texas Department of Transportation (TxDOT), Standard Specifications for Construction of Highways, Streets, and Bridges, latest edition.

1.05 DELIVERY, STORAGE, AND HANDLING

1. Unload and handle materials with equipment of adequate capacity.
2. Store materials on site in reasonably level, well drained area free from brush.
3. Store individual pieces and bundles with safe walking space between to allow full view for inspection purposes.

1.06 PROJECT CONDITIONS

1. Bore so as to not interfere with, interrupt, or endanger surface and activity thereon.
2. Minimize subsidence of surface, structures, and utilities above and in the vicinity of bore.
3. Support ground continuously to prevent loss of ground and keep perimeter stable.
4. Be responsible for settlement resulting from operations.
5. Repair and restore damaged property to its original condition before being disturbed which is subsidiary to this bid item.

1.07 ADDITIONAL CRITERIA FOR WORK UNDER RAILROADS

1. Do not schedule work within and adjacent to Railroad property until Engineer and Railroad approve submittals, including proper Railroad insurance, and permit.
 - a. Approval does not relieve Contractor of responsibility for adequacy and safety of procedures.
2. Give railroad advance written notice as described in permit, copied to Engineer, before entering and working on railroad property.
3. Place in effect before work proceeds, safety, precautionary and protective devices and services required by Railroad.
4. Follow AREMA or other applicable railroad specifications and permit requirements.

1.07 OPTIONS [Not Used]

1.08 GUARANTEES [Not Used]

2.00 PRODUCTS

2.01 MATERIALS: As shown on plans and Specifications in accordance with types of pipe or box in conformance with TxDOT Standard Specifications, Item 476.2 "Jacking, Boring, or Tunneling of Pipe or Box".

2.02 MIXES [Not Used]

2.03 FABRICATIONS [Not Used]

2.04 MANUFACTURED PRODUCTS [Not Used]

3.00 EXECUTION

3.01 INSTALLATION

A. CONSTRUCTION:

1. Excavate suitable shafts or trenches for conducting the jacking, boring, or tunneling operations and for placing end joints of the pipe or box if the grade at the jacking, boring, or tunneling end is below the ground surface. Protect excavations deeper than 5 ft as specified in 19000 Trench Protection System and 19000-1 Trench Shoring Requirements.
2. Install pipe or box so there is no interference with the operation of street, highway, railroad, or other facility and no embankment or structure is weakened or damaged.
3. Repair any pipe or box damaged in jacking, boring, or tunneling.
 - a. Remove and replace any pipe or box damaged beyond repair at the Contractor's expense.
4. Immediately after installation of pipe or box, backfill shafts or trenches excavated to facilitate jacking, boring, or tunneling.

B. JACKING:

1. Provide jacks suitable for forcing the pipe or box through the embankment. Use even pressure to all jacks during operation. Provide a suitable jacking head and suitable bracing between the jacks and the jacking head to apply uniform pressure around the ring of the pipe or circumference of the box.
2. Use joint cushioning or plywood or other approved material. For plywood cushioning material, use ½ inch minimum thickness for pipe diameter 30 in. or less, and use ¾ in. minimum thickness for diameter greater than 30 in. Use ¾ in minimum thickness for all boxes.
3. Use cushioning rings of single or multiple pieces.
4. Provide a suitable jacking frame or backstop. Set the pipe or box to be jacked on guides that support the section of the pipe or box, and direct it on the proper line and grade.
5. Place the entire jacking assembly in line with the direction and grade of the pipe or box.
6. In general excavate the embankment material just ahead of the pipe or box, remove the material through the pipe or box, and force the pipe or box through the embankment with jacks into the space provided.
7. Ensure that excavation for the underside of the pipe for at least ½ of the circumference of the pipe conforms with the contour and grade of the pipe.
8. Ensure that the excavation for the bottom slab of the box conforms to the grade of the box. If desired, over excavate to provide not more than 2 in. of clearance for the upper portion of the pipe box. Taper this clearance to zero at the point where the excavation conforms to the contour of the pipe or box. Pressure-grout any over excavation of more than 1 in.
9. The distance that the excavation extends beyond the end of the pipe or box must not exceed 2 ft. Decrease this instance as necessary to maintain stability of the material being excavated.
10. Jack the pipe or box from the low or downstream end. The final position of the pipe or box must not vary from the line and grade shown on the plans by more

- than 1 in. in 10 ft. Variations must be regular and in one direction, and the final flow line must be in the direction shown on the plans.
11. If desired use a cutting edge of steel plate around the head of the pipe or box extending a short distance beyond the end.

C. BORING:

1. Bore from a shaft in an approved location provided for the boring equipment and workmen.
2. Dispose of excavated material using a method approved by the Engineer.
3. Use water or other fluids in connection with the boring operation only as necessary to lubricate cuttings; do not use jetting.
4. In unconsolidated soil formations, use a gel-forming colloidal drilling fluid consisting of high-grade, carefully processed bentonite to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of the pipe.
5. Allowable variations from line and grade are specified in TxDOT Standard Specifications, Section 476.3.A, "Jacking." Pressure-grout any over excavation of more than 1 in.
6. Use a pilot hole or auger method for the boring.
 - a. PILOT HOLE METHOD. Bore a 2-in. pilot hole the entire length of the crossing, and check it for line and grade on the opposite end of the bore from the work shaft. This pilot hole will serve as centerline for the larger diameter hole to be bored.
 - b. AUGER METHOD. Use a steel encasement pipe of the appropriate diameter equipped with a cutter head to mechanically perform the excavation. Use augers of sufficient diameter to convey the excavated material to the work shaft.
 - c. TUNNELING. Use an approved tunneling method where the characteristics of the soil, the size of the proposed pipe, or the use of monolithic pipe would make the use of tunneling more satisfactory than jacking or boring or when shown on the plans.
 - d. JOINTS. If corrugated metal pipe is used, make joints by field bolting or by connecting bands, whichever is feasible. If reinforced concrete pipe is used, make the joints in accordance with TxDOT Standard Specifications, Item 464, "Reinforced Concrete Pipe." If reinforced concrete box is used, make the joints in accordance with Item 462, "Concrete Box Culverts and Storm Drains."

3.02 FIELD QUALITY CONTROL [Not Used]

3.03 CLEAN AND ADJUST [Not Used]

3.04 SCHEDULES [Not Used]

END OF SECTION

02224 -PIPE BORING, JACKING, TUNNELING AND ENCASEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work to be performed under this Specification shall consist of furnishing and installing all materials and equipment and performing all labor required to install pipelines crossing under highways, railroads, and streets by boring, jacking, and tunneling, as specified herein. All sewer bores will be accomplished by dry mechanical bore unless otherwise pre-approved by the Engineer. Water line bores may utilize the wet boring technique. All carrier pipes within the encasement conduit shall be restrained joint pipe of the type specified on the plans, or pre-approved by the Engineer.
- B. When the work per this item falls within a TxDOT or Railroad right of way, the stricter of the applicable standards apply. This requirement includes all insurance, notification, permitting, signage, etc. required by the right of way owner.

1.2 MEASUREMENT AND PAYMENT

A. MEASUREMENT

- 1. Openings provided by boring, jacking, and tunneling (including carrier pipe) will be measured by the linear foot along the centerline of the opening, as measured from end of pipe to end of pipe placed by boring, jacking and tunneling. There will not be any classification for payment according to depth.
- 2. Concrete support slab in the pits and all other work necessary to meet the requirements of the Texas Department of Transportation, railroad company, County, and City will not be measured.
- 3. Openings provided by boring, jacking and tunneling will be paid for at the unit price bid per linear foot. The unit price bid for boring jacking and tunneling shall be full compensation for furnishing and placing all materials, labor, tools, carrier pipe, carrier pipe restraint, casing spacers, equipment, pits, concrete support slabs and incidentals necessary to complete the work.

1.3 SUBMITTALS

- A. Submit manufacturer's product data on encasement pipe.

- B. Submit manufacturer's "Certificate of Compliance" to this part of the specifications for materials furnished for the project.
- C. The Contractor or subcontractor performing the work described under this section shall demonstrate technical skill and experience in previous work of this nature. Work experience shall be submitted to the Engineer.
- D. Casing spacer data sheets demonstrating compliance with this specification.

PART 2 – PRODUCTS

2.1 MATERIALS

Steel Pipe, Ductile Iron Pipe, Reinforced Concrete Pipe, and PVC Pipe may be used as encasement material, unless otherwise shown on the plans. The nominal inside diameter of the encasement pipe shall be as indicated below, unless otherwise shown on the plans.

A. STEEL PIPE

Encasement pipe shall conform to ASTM Specification A134, Mild Carbon Steel, A139, Grade A, or AWWA C200-91 Grade B, butt-welded joints with entire circumference welded by a certified welder shall be in accordance with AWWA C200-86 Section 3. All steel casing shall have a wall thickness as shown in the table below:

Carrier Pipe Nominal Diameter	Casing Pipe Nominal Diameter	Casing Pipe Minimum 1 Thickness
6"	14"	3/8"
8"	16"	3/8"
10"	18"	3/8"
12"	20"	3/8"
16"	24"	3/8"
18"	30"	1/2"
24"	36"	1/2"

1. Casing Pipe Thickness for Railroad crossings shall be a minimum of 1/2-inch thick regardless of diameter.
2. Nominal diameter of casing pipe may be larger as needed for restrained joint pipe.

B. DUCTILE-IRON PIPE

Encasement pipe shall conform to the current AWWA C150 and C151 standards. Pipe shall be thickness Class 250 or greater, unless otherwise shown on the plans.

C. REINFORCED CONCRETE PIPE

Encasement pipe shall conform to the current ANSI C-76 standards. Pipe shall be Class III or IV, unless otherwise shown on the plans. D. PVC PIPE
Encasement pipe shall conform to the current ASTM D2241 or AWWA C905 standards. Pipe shall be DR 26 or SDR 26, unless otherwise shown on the plans. PVC pipe shall be used only when specified on the plans.

D. GROUT

Grout shall be in accordance with SECTION 04 05 12 – MORTAR AND GROUT.

E. CASING SPACERS

Stainless Steel casing spacers shall be required in all casing pipes and shall be manufactured by Cascade Products, Advance Products & Systems, Inc model no. SSI8 or approved equal. The casing spacers shall be affixed to the carrier pipe at a spacing of 6'8" or per the manufacturers recommendations if less than 6'8".

F. END SEALS

End seals shall be 1/8" thick synthetic rubber secured with stainless steel banding straps. Other end seals shall be constructed only as pre-approved by the engineering inspector.

2.2 TESTING REQUIREMENTS

A. ALLOWABLE TOLERANCES

Where grades or elevations are shown on the plans for the pipeline to be installed by boring, jacking, and tunneling operations, maximum deviation of plan elevation shall be 0.2 foot. The maximum deviation of alignment over the length of the bore shall be 0.2 foot. The Engineer shall determine the corrective action to be taken for tolerances above those stated in this specification.

PART 3 – EXECUTION

3.1 CONSTRUCTION METHODS

A. ENCASEMENT REQUIREMENTS

Encasement pipe shall be required for all water mains crossing major collector and arterial street crossings. Encasement pipe for sewer mains

shall be placed as required by the City Engineer. The casing pipe shall extend two feet (2') beyond the back of curb. Encasement pipes may be installed by open cut with the approval of the engineer.

B. BORE AND TUNNEL PITS

Unless more stringent requirements regarding location of bore and tunnel pits are noted on the plans, or are required by TXDOT, Railroad, County, or City, to conform to the requirements that follow:

1. The Conduit to be installed by boring, jacking and tunneling shall extend to distances as shown in the Standard Details.
2. If necessary to prevent cave-ins, sheet, shore, or brace the pit in accordance with OSHA regulations. All pits shall be covered with 1/2" thick steel plates. Steel plates shall be on-site prior to excavating the pit. If bore pits are too big to cover with steel plates, Contractor shall install chain link fence, completely and securely, around exposed pit to a height of 6 feet.
3. General: Unless otherwise noted, extend auger hole 10 feet beyond edge of pavement, railroad tie, or other structure. The hole is to be bored mechanically, using a pilot hole. An approximate 2-inch hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. This pilot hole shall serve as the centerline of the larger diameter hole to be bored. The use of water or other fluids in connection with the boring operation will be permitted only to the extent to lubricate cuttings, jetting will not be permitted. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10 percent of high-grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter. Overcutting in excess of one inch shall be remedied by pressure grouting the entire length of the installation.

3.2 CONSTRUCTION METHODS FOR DRY BORING

- A. All sewer bores will be accomplished by dry mechanical bore unless otherwise pre-approved by the Engineer.
- B. Only workmen experienced in boring operations shall perform the work.
- C. The use of water or other fluids in connection with the boring operation will NOT be permitted except for a minor required amount of bentonite solution for cutting head.

- D. The casing pipe shall be placed in the bore hole simultaneously while boring is being performed. Installing the encasement conduit immediately by pulling it in place from opposite the boring machine or by jacking the conduit through the bore is not acceptable. Take proper care to secure the joints of the conduit as subsequent sections are installed by welding joints. Provide a steel rail or timber cradle in the pit to support and guide the conduit in its installation.
- E. If after completion of the installation of the conduit, there is more than one inch (1") clearance between the outside of the barrel of the conduit and the wall of the bore, grouting of these voids will be required. If during construction of the bore, a cave-in occurs within the bore, grouting of the voids between the conduit and the walls of the bore will be required throughout the length of the bore.
- F. Conform to the requirements of the Texas Department of Transportation, Railroad Company, County, or City having jurisdiction over the right-of-way involved, as to details of construction methods and time of construction. All work necessary to meet the requirements of the Texas Department of Transportation, Railroad Company, County, or City will be considered incidental to the installation of the pipeline in the right-of-way. The Contractor shall abide by the more stringent of these specifications, or the specifications of the regulatory agencies.

3.3 CONSTRUCTION METHODS FOR WET BORING

- A. All sewer bores will be accomplished by dry mechanical bore unless otherwise pre- approved by the Engineer. (see above)
- B. Only workmen experienced in boring operations shall perform the work. A pilot hole must be successfully completed to the satisfaction of the engineer prior back reaming the bore.
- C. The use of water or other fluids in connection with the boring operation will be permitted only to lubricate cuttings. Jetting will not be permitted. In consolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least ten (10%) percent of high-grade bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and lubricate removal of cuttings and installation of the pipe immediately thereafter.
- D. While boring is being performed, install the encasement conduit immediately by pulling it in place from opposite the boring machine or by jacking the conduit through the bore. Encasement conduit may be

placed after the boring operation is complete, if permission is obtained from TXDOT, the railroad company, the City, or the County. Take proper care to secure the joints of the conduit as subsequent sections are installed, by use of cables or welding joints. Provide a steel rail or timber cradle in the pit to support and guide the conduit in its installation.

- E. If after completion of the installation of the conduit, there is more than one inch (1") clearance between the outside of the barrel of the conduit and the wall of the bore, grouting of these voids will be required. If during construction of the bore, a cave-in occurs within the bore, grouting of the voids between the conduit and the walls of the bore will be required throughout the length of the bore.
- F. Grouting material and equipment shall be on the jobsite before beginning installation of the conduit, in order that the grouting around the encasement conduit is to be started immediately after pipe is in place.
- G. Conform to the requirements of the Texas Department of Transportation, Railroad Company, County, or City having jurisdiction over the right-of-way involved, as to details of construction methods and time of construction. All work necessary to meet the requirements of the Texas Department of Transportation, Railroad Company, County, or City will be considered incidental to the installation of the pipeline in the right-of-way. The Contractor shall abide by the more stringent of these specifications, or the specifications of the regulatory agencies.

3.4 CONSTRUCTION METHODS FOR JACKING

- A. Unless otherwise specified, the methods and equipment used in jacking conduit shall be the Contractor's option, provided that the proposed method is pre-approved by the Engineer. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein.
- B. If, after completion of the installation of the conduit, there is more than one (1") inch clearance between the outside of the barrel of the conduit and the wall of the tunnel, the Contractor shall completely grout the conduit in place throughout its entire length. If, during the jacking operation, a cave-in occurs, the Contractor shall grout the entire conduit in place throughout its entire length.

3.5 CONSTRUCTION METHODS FOR TUNNELING

- A. Excavate the tunnel in such a manner and to such dimensions that will permit placing of the proper supports in accordance with OSHA

Regulations necessary to protect the excavation. Make adequate provisions for the safety and health of the workmen. Use only air or electric powered equipment in the tunnel. Provide adequate illumination and ventilation.

- B. Excavate only enough earth to allow installation of the tunnel liner plate. Remove earth from within tunnel and install the next section of tunnel liner plates.
- C. After completion of the tunnel, or at intervals directed by the Engineer, grout the entire void between the tunnel lining. If after completion of the tunnel there are sags in invert of the liner that exceed 0.2 feet of a straight line projected through the tunnel, grout the invert to eliminate the sags.

3.6 SPECIAL PROVISIONS FOR BELL & SPIGOT ENCASUREMENT PIPE

- A. Where pipe using bell and spigot joints is installed as encasement pipe, completely grout the voids between the outside of the encasement pipe and the inner wall of the bore or tunnel throughout the length of the pipe. If directed by the City Engineer, the joints shall be welded to prevent the joints from slipping with respect to each other.

3.7 SUPPORT OF PIPES ACROSS BORE OR TUNNEL PITS

- A. After completion of the bore or tunnel and installation of the carrier pipe with the bore or tunnel, remove all loose earth and debris from the pit down to undisturbed earth. Pour a continuous 2,000 psi concrete or cement stabilized sand support under the carrier pipe from the edge of the bore or tunnel to the first joint in the trench past the end of the pit. The concrete support shall be brought up to the horizontal centerline of the pipe.

3.8 CARRIER PIPE

- A. Carrier pipe may be pushed or pulled through the completed encasement pipe. Casing spacers by Cascade Waterworks or pre-approved equivalent should be placed on the carrier pipe to insure approximate centering within the encasement pipe and to prevent damage during installation. Care must be exercised in order to avoid metal-to-metal contact. The ends of the encasement pipe will be sealed with rubber seals and stainless steel bands. In order to avoid the transfer of earth and live loads to the carrier pipe, the space between the carrier pipe and encasement pipes shall not be filled completely.

- B. All carrier pipe installed within a casing shall be restrained. The restrained section shall extend at least five feet (5') beyond both ends of the casing pipe. Lock joint pipe, retainer glands, or restrainer gaskets may be used for this application.
- C. When ductile iron pipe is used for the carrier pipe, all ductile iron pipes shall be poly- wrapped per the specifications.

3.9 SPOILS

- A. Spoil locations shall be pre-approved by the engineering inspector. When no suitable location for spoil can be found on site, the contractor shall be required to haul and dispose of this material at no extra cost. Where spoils are to be placed on parking areas (asphalt or concrete), sidewalks, or other paved surfaces, the spoils shall be placed on a barrier to prevent the soil from embedding into the paved surface.

END OF SECTION

SECTION 02226 EXCAVATION, BACKFILL AND COMPACTION FOR PAVEMENT

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. Prior to commencement of this work, all required erosion control and tree protection shall be in place.
- B. Perform all required excavation, backfill and compaction within the limits of right of way and adjacent thereto (except excavations specifically described and provided for elsewhere in the specifications).
- C. Remove, properly use, or dispose of all excavated materials.
- D. Shape and finish all earth work in conformance with lines and grades as shown on the plans or as specified by the Engineer.
- E. Schedule work to avoid property owner inconvenience as practical during construction.
- F. Exercise care in operating applicable equipment beneath or adjacent to trees, sidewalks, poles, and other existing features to prevent damage.
- G. Restore obstructions removed to accommodate construction equipment or to facilitate excavation.

1.02 CLASSIFICATION:

- A. All street excavation shall be unclassified, regardless of material encountered.
- B. Any reference to rock or any other material on the plans, or in these specifications, is not to be construed as classification of the excavation.

1.03 REFERENCES

- A. ASTM D698 - Moisture-Density Relations of Soils (Standard).
- B. ASTM D4318 - Test for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.04 EXISTING UTILITIES

- A. Where pipes, ducts and structures are encountered in the excavation but are not shown on the Drawings, immediately notify the Engineer.

1.05 DEFINITIONS

- A. Classification: Earthwork materials are classified in accordance with definitions in this Article.
- B. Topsoil: Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes roots and other vegetation.
- C. Pavement Select Fill: Select fill material excavated on site or suitable borrow material consisting of inorganic sandy clay meeting specified requirements.
- D. Natural Subgrade: Consists of that portion of the surface on which a compacted embankment or pavement is constructed, after removal of 6-inch topsoil layer, as described in Section 02210.
- E. Compacted Embankment: A subgrade under pavement consisting of fill placed and compacted between the top of compacted natural subgrade and underside of pavement and including fill areas adjacent to paving within limits shown on Typical Cross Sections.
- F. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.
- G. Excavation: Excavation of every description and of whatever substances encountered within the grading limits of the project to the lines and grades indicated on the Drawings.
- H. Compaction: Compaction of subgrade soil materials, shall be measured as a percent of Standard Proctor Density at the specified moisture content as determined by ASTM D698

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Under Pavement
 - 1. Inorganic sandy clay.
 - 2. Optimal plasticity index between 7 and 20.
 - 3. Optimal liquid limit of 35 or less.
 - 4. No rock or pieces larger than 3 inches greatest dimension.
- B. All fill soils shall be free of organic material and debris. A quality control program shall be established by the Contractor to check that zones of unsuitable soils are not allowed in the paving areas.

PART 3 - EXECUTION

3.01 HANDLING OF TOPSOIL

- A. Remove top 6 inches of topsoil within limits of the paving section, and area adjacent to paving section as required, and stockpile on the Owners property in an approved location.

3.02 STRIPPING OF GROUND SURFACE

- A. All vegetation, all decayed vegetable matter, rubbish and other unsuitable material within the areas to be graded, not removed by clearing, shall be stripped or otherwise removed to 18 inches below ground level before grading or other earthwork is started. In no case will such material be allowed to remain in or on the areas to be graded.

3.03 EXCAVATION

- A. Objective: As shown on the Drawings, excavate to lines, grades and elevations required for subsequent construction of embankments, flexible base, or pavement. Remove materials within the indicated limits and dispose as directed.
- B. Drainage: During excavation, maintain grades for complete drainage. When directed, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling: If, at time of excavation, it is not possible to place material in the proper section of permanent construction, stockpile the material in approved areas for later use.
- D. Stone or Rock: Stones or rock fragments larger than 1-inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing: Uniformly dress, cut and fill slopes to slope, cross section and alignment, as shown.

3.04 NATURAL SUBGRADE UNDER PAVEMENTS

- A. Remove existing earth as required for placement of pavement section as indicated on the Drawings. Proof roll excavated surface with a 20 ton or larger roller to identify soft or undesirable material and remove such soft or undesirable material to suitable material beneath at least 2 feet below grade. Break down sides of holes or depressions to flatten the slopes.
- B. Fill any such hole or depression with appropriate soil with similar classification, moisture content, and density as adjacent soils.
- C. Grade adjustments within pavement construction limits shall be accomplished with pavement select fill, placed in maximum 8-inch lifts moistened and compacted as

specified in this Section.

- D. After depressions have been filled, grade adjustments made, and immediately before placement of pavement section, thoroughly loosen the foundation material to a depth of 8 inches. Remove roots and debris turned up while loosening the soil. Adjust moisture and recompact the subgrade as specified in this Section.

3.05 PLACING EMBANKMENT FILL FOR GRADE ADJUSTMENTS

- A. Inspection of Natural Subgrade: Proof roll excavated surface with a 20 ton or larger roller to identify soft or undesirable material and remove such soft or undesirable material to suitable material beneath. Any soft or compressible areas detected during the re-compaction process shall be undercut such that sound subgrade soils are exposed and recompact. Do not place select fill for grade adjustments to the natural subgrade until the surface has been approved.
- B. Prior to placing pavement fill, scarify the natural subgrade to a depth of 6 inches. As needed, adjust the moisture content to between optimum and plus 4 percent. Recompact to the subgrade to a dry density between 95% of the maximum Standard Proctor Density, as determined by ASTM D698.
- C. Removing Debris: During the dumping and spreading process, remove all roots, stones, and debris that are uncovered in the select material.
- D. Spreading Fill: After dumping, spread the pavement select fill in horizontal layers over the entire fill area. The thickness of each layer before compaction shall not exceed 8-inches and compact to the moisture/density values specified above. Place fill adjacent to pavement sections to elevations indicated.
- E. Attaining Proper Bond: If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

3.06 MOISTURE CONTROL

- A. Intent: Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content of the pavement base material shall not vary from -2 percent optimum, as determined by ASTM D698, to more than plus 3 percent of optimum. The moisture content of the natural subgrade under pavement sections, including grade adjustments with pavement select fill, as determined by ASTM D698 shall be maintained between optimum and plus 4 percent of optimum.
- B. Adjustment: If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by disking or harrowing if necessary. When the material is too dry, sprinkle

each layer with water. Work the moisture into the soil by harrowing or other approved method.

3.07 COMPACTION

- A. Compact each layer of pavement select fill with suitable rollers as necessary to obtain a dry density of 95% maximum dry density within the specified range of the moisture content, according to ASTM D698.

3.08 MATERIAL DISPOSAL

- A. Excess Excavated Material (soil material free of trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has been approved) shall be removed from the construction site before Final Inspection. Approved excess material shall be deposited on the Owner's property in an approved location.
- B. Waste Material (soil material including trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has not been approved) shall be removed from the project site before Final Inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

3.09 TESTING AND CONTROL

The testing laboratory will make tests of in-place density in accordance with ASTM Standards (Specification Section 01460). Backfill operations will be monitored continuously by the testing laboratory.

3.10 MEASUREMENT AND PAYMENT

No separate payment shall be made to the CONTRACTOR for the work described in this Section. Such work shall be considered incidental to the project and the payments made under specific Pay Items shall be considered as full compensation for these requirements.

END OF SECTION

SECTION 02227 EXCAVATION, BACKFILL AND COMPACTION FOR UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Excavating, trenching, backfilling and compacting for water distribution mains, sanitary sewers, manholes, drainage and other utility systems and appurtenances, and the disposal of excess excavated material.

1.2 RELATED SECTIONS:

- A. Grading and earthwork - Section 02210.
- B. Excavating, Backfilling and Compacting for Pavement - Section 02226.

1.3 REFERENCES:

- A. ASTM C33 - Concrete Aggregates.
- B. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- C. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³).

1.4 PROTECTION OR REMOVAL OF UTILITY LINES:

- A. The Contractor shall anticipate all underground obstructions such as, but not limited to, water mains, gas lines, storm and sanitary sewers, telephone or electric light or power ducts, concrete, and debris. Any such lines or obstructions indicated on the Drawings show only the approximate locations and shall be verified in the field by the Contractor. The Engineer will endeavor to familiarize the Contractor with all known utilities and obstructions, but this shall not relieve the Contractor from full responsibility in anticipating all underground obstructions whether or not shown on the Drawings.
- B. The Contractor shall, at his own expense, maintain in proper working order and without interruption of service all existing utilities and services which may be encountered in the work, except that with the consent of the Utility Owner such service connections may be temporarily interrupted to permit the Contractor to remove designated lines or to make temporary changes in the locations thereof as will aid in the completion of the work and at the same time maintain service to the property so originally benefited. The cost of making any temporary changes shall be at the Contractor's expense.

- C. Before starting construction, the Contractor shall notify all utility companies involved to have their utilities located and marked in the field. All underground utilities shall then be uncovered to verify location and elevation before construction begins. The Contractor shall obtain all necessary permits.

PART 2 - PRODUCTS

2.1 EARTH BACKFILL:

- A. Earth Backfill shall be free of lumps, stones, trash and spongy or otherwise objectionable material, and shall be approved by the Engineer. Approved backfill material may be from the excavation or borrowed.

2.2 SAND:

- A. Use sand that is free from clay lumps, organic and other deleterious material, and having a plasticity index of not less than 4 or greater than 12, as determined by ASTM D424.

2.3 CRUSHED ROCK:

- A. Provide durable crushed rock free of clay lumps, organic or other deleterious material. Crushed rock size shall be No. 57 or No. 67 in accordance with ASTM C33 Grading Requirements for Coarse Aggregates.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION:

- A. Examine utility routes and coordinate excavation work to eliminate installation conflicts.
- B. Allow room for stockpiling excavated material and utility construction material during utility construction.

3.2 TRENCH EXCAVATION:

- A. Procedure: Excavate to indicated or specified depths.
 - 1. Excavate by open cut.
 - 2. Do not use excavated material composed of rocks, chunks or clods larger than 6-inches for backfill. Dispose of such material and provide other suitable material for backfill without additional expense.

3. During excavation, stock pile material suitable for backfilling in an orderly manner far enough from the bank of the trench to avoid overloading, slides or cave-ins.
 4. Grade as necessary to prevent surface water from flowing into trenches or other excavations.
 5. Cut banks of trench in pipe zone as nearly vertical as practical. Remove stones as necessary to avoid point-bearing. Over-excavate wet or unstable soil from the trench bottom to permit construction of a more stable bed for pipe. Over excavation shall be filled and tamped with cement sand or other approved material to the required grade.
 6. Dig the trench the proper width as shown. If the trench width below the top of pipe is wider than specified in this Section or shown on Civil Drawings, then install additional cement-sand compacted backfill. No additional payment will be made.
 7. Accurately grade the trench bottom to provide proper bedding as required for pipe installation.
 8. If any excavation is carried beyond the lines and grades required or authorized, the Contractor shall, at his own expense, fill such space with concrete or other suitable material as directed by the Engineer. No additional payment will be made.
- B. Pipe Zone: The pipe zone is defined as including the pipe bedding, backfill to one-half the pipe diameter (the springline) and the initial backfill to 12 inches above the top of the pipe.
- C. Pipe Bedding:
Class B Bedding: Accurately grade the bottom of the trench 6 inches below the bottom of the pipe and limit clear space on either side of the pipe to 9 inches at and below the top of the pipe. Place a minimum of 6 inches of natural rock or select fill up to the flow line of the pipe or above before pipe is laid. Install pipe and place additional crushed rock around the pipe and to the springline of the pipe. Lightly compact the crushed rock by tamping with mechanical tamper. Complete bedding with compacted sand to 12-inches above the top of the pipe. Crushed rock or select fill shall conform to size and gradation specified in Article 2.3 or Sect. 2234, 2.1.A.1 above.
- D. Water in Excavation: Keep work free from ground or surface water at all times. Provide pumps of adequate capacity or other approved method to remove water from the excavation in such a manner that it will not interfere with the progress of the work or the proper placing of other work. Ground or surface water will not be allowed to drain into or be pumped into an existing sanitary sewer system. If

the work includes connection to an existing sanitary sewer, a temporary water-tight plug shall be installed and maintained within the pipe for the duration of the contract and bedding material interrupted in a manner approved by the Engineer to isolate new construction from the existing system.

- E. Do not endanger spread footings with trench excavations. Trench excavations shall not encroach within the area below a footing defined by a 1:1 slope away from the bottom corner of any footing.

3.3 UTILITY INSTALLATION:

- A. Storm Sewer Culverts: Grade trenches to the line and grade required for proper installation of the pipe. Provide Class B bedding for concrete pipe or culvert installation.
- B. Excavation for Appurtenances: Excavate sufficiently for manholes, utility pull boxes, barscreen structure, and similar structures to leave at least 2 feet clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks. Any over-depth excavation below such appurtenances not directed will be considered unauthorized and will be refilled with cement-sand or concrete, as directed by the Engineer, at no additional cost to the Owner.

3.4 BACKFILLING:

- A. Criteria: Do not backfill trenches to a point greater than 2 feet above top of pipe until all required pressure tests are performed and utility systems as installed conform to specified requirements of appropriate sections. Backfill trenches to ground surface with material as specified. Reopen trenches improperly backfilled to depth required for proper compaction. Refill and re-compact as specified, or otherwise correct the condition in an approved manner.
- B. Open Areas:
 - 1. In the pipe zone, place backfill (bedding) evenly and carefully around, under and over pipe in lifts no thicker than 6 inches. Compact with mechanical hand tampers to 95 percent density according to ASTM D698, until there is a cover of not less than 1 foot over utility lines. Use bedding and backfill material as scheduled for on plans. Take special care not to damage pipe wrapping or coating.
 - 2. Above the pipe zone, deposit earth backfill in 8-inch lifts. Compact each lift to 95 percent maximum dry density according to ASTM D698 at minus 1 to plus 3 percent of optimum moisture content.
 - 3. All forms, lumber, trash and debris shall be removed from trenches, manholes and other utility structures. Backfill for manholes, utility pull boxes, solid waste wash rack, and other utility structures shall be placed symmetrically on all sides in lifts no thicker than 8 inches. Each lift shall be compacted to

95 percent dry density according to ASTM D698. Use cement-sand backfill material of optimum moisture content to depth indicated and then complete backfilling with earth backfill to grade, compacted at a moisture content from minus 1 to plus 3 percent of optimum, allowing for depth of topsoil.

C. Pavement Sections:

1. In the pipe zone, deposit cement-sand backfill material in 6-inch lifts. Compact each lift to 95 percent density according to ASTM D698.
2. Above the pipe zone, deposit scheduled backfill in 8-inch lifts. Compact each lift to 95 percent maximum dry density according to ASTM D698 at optimum moisture content. Cement-sand backfill material shall be placed as required by the construction drawings. Cure cement-sand layer at least 3 days before placing pavement.
3. For manholes and utility pull boxes in pavement sections, backfill with cement-sand to bottom of proposed pavement. Cure cement-sand layer at least 3 days before placing pavement. Cement sand back fill material shall be deposited in 8-inch lifts, compacted to 95 percent density according to ASTM D698.

3.5 TESTS FOR DISPLACEMENT OF SANITARY SEWERS:

- A. All plastic pipes shall be tested for deflection by pulling a mandrel with an outside diameter equal to 95 percent of the original inside diameter of the pipe through the pipe after backfilling is complete. Mandrel shall be pulled by hand line. Should the mandrel meet any resistance, the Contractor shall clean the line, or correct the resistance, and repeat the test. Any pipe not meeting this test shall be removed and installed, or replaced if damaged.

3.6 DISPOSAL OF EXCESS MATERIAL:

- A. Excess Excavated Material (soil material free of trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has been accepted by the Owner): Remove excess excavated material from the construction site before Pre-final Inspection. Approved excess material shall be deposited on the Owner's property as directed by the Owner.
- B. Waste Material (soil material including trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has not been accepted by the Owner): Remove waste material from the project site before final Inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

PART 4 - TESTING AND CONTROL

- A. The testing laboratory will make tests of in-place density in accordance with ASTM Standards. Backfill operations will be monitored continuously by the testing laboratory at structures. It will be the responsibility of the CONTRACTOR to notify the testing laboratory before backfill operations begin.

PART 5 - MEASUREMENT AND PAYMENT

- A. No separate payment shall be made to the CONTRACTOR for the work described in this Section. Such work shall be considered incidental to the project and the payments made under specific Pay Items shall be considered as full compensation for these requirements.

END OF SECTION

SECTION 02228 LOADING & HAULING OF UNCLASSIFIED FILL MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. Perform all required work within the limits of right-of-way and adjacent thereto for loading, hauling, shaping and/or stockpiling of fill material (except excavations specifically described and provided for elsewhere in the specifications).
- B. Loading and hauling of all excavated materials.
- C. Shape and finish all earthwork in conformance with lines and grades as shown on the plans or as specified by the ENGINEER.
- D. Stockpile all earthwork in conformance with lines and grades as shown on the plans or as specified by the ENGINEER.
- E. Schedule work to avoid property owner inconvenience as practical during construction.
- F. Exercise care in operating applicable equipment beneath or adjacent to trees, sidewalks, poles, and other existing features to prevent damage.
- G. Restore obstructions removed to accommodate equipment or to facilitate loading, hauling, shaping or stockpiling all earthwork.

1.02 CLASSIFICATION:

- A. All material loaded and hauled shall be unclassified, regardless of material encountered.
- B. Any reference to rock or any other material on the plans, or in these specifications, is not to be construed as classification of the excavation.

PART 2 - PRODUCTS

2.01 LOADING

- A. Loading shall be by rubber wheel, track loader or any other method approved by the ENGINEER.
- B. The loader bucket shall be a standard unit volume to allow for estimation of hauled material.
- C. The dump truck(s) shall be standard unit volume to allow for estimation of

hauled material.

2.02 HAULING

- A. All material shall be delivered to areas specified on plans or as noted on the bid proposal.
- B. All hauling equipment shall abide by all applicable local, state and federal rules, regulations and statues. Every effort shall be made to stay on approved truck routes during hauling operations.
- C. All haul routes within public rights of way shall be kept clean.

2.03 SHAPING

- A. All material shall be shaped to conform to grades and lines shown on the plans or as directed by the ENGINEER.

2.04 STOCKPILING

- A. All material shall be stockpiled to conform to grades and lines shown on the plans or as directed by the ENGINEER.

PART 3 - EXECUTION

3.01 UNCLASSIFIED FILL MATERIAL LOADING, HAULING, SHAPING & STOCKPILING:

- A. Perform all loading of unclassified fill material as shown on the plans or noted on the bid proposal.
- B. Haul unclassified fill material to areas requiring fill and place in accordance with these specifications. Determination of suitable material will be made by ENGINEER. Haul unsuitable material to waste sites.
- C. Shape, slope and fill sections uniformly as noted on plans or other controlling feature, or as designated by ENGINEER. Smooth bank to provide a neat finished appearance.
- D. Strip, salvage and stockpile topsoil in sufficient quantity to allow a uniform 6-inch lift over all disturbed areas not otherwise surfaced. Topsoil is included in unclassified excavation.
- E. Stockpile unclassified fill material as noted on plans or bid proposal, in accordance with these specifications. Determination of stockpile height will be made by the ENGINEER.

3.03 EXCESS OR UNSUITABLE EXCAVATION:

- A. Dispose of excavation in excess of that needed or unsuitable for construction. As directed by the ENGINEER, excess or unsuitable excavation may be used for widening of embankments, or flattening of slopes, or as otherwise specified.
- B. Obtain approval of the ENGINEER as to disposition and method for disposal of excess or unsuitable excavation.

3.04 GENERAL:

- A. Provide all labor, equipment and associated materials to load, haul, shape and/or stockpile unclassified fill material.

PART 4 - MEASUREMENT AND PAYMENT

4.01 LOADING, HAULING & SHAPING OF UNCLASSIFIED FILL MATERIAL:

- A. Unless otherwise specified, all Loading, Hauling & Shaping of Unclassified Fill Material shall be considered incidental to the overall project costs.
- B. When included as a separate pay item, Loading, Hauling & Shaping of Unclassified Fill Material, as authorized, shall be measured in its loose position. The volume shall be determined by the average end area method and multiplied by a factor of 1.33 for estimation of hauling quantities. All work performed shall be paid for at the contract unit bid price per cubic yard for loading, hauling, shaping and/or stockpiling of unclassified fill material.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required by the work, all in accordance with the plans and specifications.
- D. Adjustment of any facilities to accommodate loading, hauling, shaping or stockpiling of fill material shall be considered incidental to the bid.

END OF SECTION

SECTION 02230 EXCAVATION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of excavating and properly utilization, or otherwise satisfactorily disposal of, all excavated materials, of whatever character, within the limits of work.
- B. Excavation shall also consist of constructing, compacting, shaping and finishing of all earthwork in designated areas on the plans, as specified herein, and in conformity with the required line grades and typical cross sections or as directed by the Engineer.
- C. When not otherwise included, this item shall include the work described in Section 2101 - Preparation of Right of Way, Section 2102 - Clearing and Grubbing, Section 2102 – Embankment and Section 2238 – Concrete Removal.

PART 2 - PRODUCTS

2.01 CLASSIFICATION:

All excavations shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

- A. Prior to commencing this work, all erosion control and tree protection measures required shall be in place and all utilities located and protected.
- B. Construction equipment shall not be operated within the drip line of trees, unless otherwise indicated.
- C. Construction materials shall not be stockpiled under the canopies of trees. No excavation or embankment shall be placed within the drip line of trees until tree wells are constructed.
- D. All excavation shall be performed as specified herein and shall conform to the established alignment, grades and cross sections.
- E. Suitable excavated materials shall be utilized, insofar as practical, in constructing required embankments.
- F. The construction of all embankments shall conform to Section 2238 - Embankment. No material shall be stockpiled within the banks of a waterway.

- G. Unsuitable excavated materials or excavation in excess of that needed for construction shall be known as "Waste" and shall become the property of the Contractor. It shall become his sole responsibility to dispose of this material off the limits of the right of way in an environmentally sound manner at a permitted disposal site.
- H. Adequate dewatering and drainage of excavation shall be maintained throughout the time required to complete the work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement of the volume of excavation in cubic yards by the average end areas. Cross sectional areas shall be computed from existing ground section to the established line of the subgrade, as shown on typical sections for the limits of the right-of-way or other work limits, including parkway slopes and sidewalk areas.
- B. Measurement of the area in square yards of surface area excavated as shown on the typical sections included in the plans.
- C. Measurement of the volume of excavation is in cubic yards, based upon the average end areas taken from pre-construction cross sections and planned grades. The planned quantities for excavation will be used as the measurement for payment for this item.

4.02 PAYMENT:

- A. This item will be paid for at the contract unit price bid for "Excavation," as provided under the measurement method as included in the bid, which price shall be full compensation for all work herein specified: including dewatering, drainage, subgrade preparation, unless otherwise indicated and the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the work.
- B. When not listed as a separate contract pay item, excavation shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02240 LIME STABILIZATION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. Treating of subgrade, subbase, and base courses by the pulverization, addition of lime, mixing and compacting the mixed material to the required density.
- B. Application to natural ground, embankment, existing pavement, base or subbase under this contract, or as directed by the ENGINEER, which shall be constructed as specified herein and in conformity with the typical section, lines, grades as shown on the plans.

1.02 QUALITY ASSURANCE:

- A. Comply with the latest published edition (or addended portions thereof) of the following standards and codes:
 - 1. ASTM C—207 or Type N — Requirements for Hydrated Lime
 - 2. ASTM Designation C5 — Quick Lime for Structural Purposes
 - 3. Texas SDHPT Test Method Tex—600—J - Hydrated Lime
 - 4. ASTM D—1557 - Density of Compacted Materials
 - 5. ASTM D-2049 - Density of Compacted Materials
 - 6. Texas SDI-IPT Test Method Tex 113—E — Density of Compacted Materials
 - 7. AASHTO T—99, Method C - Density of Compacted Materials
 - 8. AASHTO M-216 - Hydrated Lime

PART 2 - PRODUCTS

2.01 HYDRATED (DRY) LIME:

- A. Use, for stabilization of soils, a dry powder consisting primarily of calcium hydroxide (Ca(OH)₂).
- B. Provide Material in accordance with Texas SDHPT Test Method TEX— 600— J and conforming to the following chemical composition:
Hydrate Alkalinity, Percent by Weight Ca(OH)₂ 90% Min. Un-hydrate Lime Content, Percent by Weight CaO 5% Max. "Free Water" Content, Percent by Weight H₂O 4% Max.

And with the following residue retainage:

Residue Retained on No. 6 Sieve	None
Residue Retained on No. 10 Sieve	1% Max.
Residue Retained on No. 30 Sieve	2.5% Max.

- C. Store and handle hydrated lime in closed, weather proof containers, storage bins, or bags until immediately before application to the road.
- D. Furnish hydrated lime in trucks, as applicable, with weight of lime measured on certified scales and clearly marked on the truck or stamped on a haul ticket.
- E. Furnish hydrated lime in bags, as applicable, bearing the manufacturer's certified weight. Bags varying more than five percent may be rejected.

2.02 HYDRATED LIME SLURRY:

- A. Provide a pumpable suspension of solids, principally composed of hydrated lime, in water.
- B. Provide material with a "Solids Content" having a hydrated alkalinity Ca(OH)_2 of not less than 90 percent by weight and a residue retainage equal to the retainage specified in Part 2.01B above.
- C. Supply Type B, commercial lime slurry, with a "dry solids content" of at least 31% by weight of the slurry (Grade 1).
- D. Procure mixing water only from City of Edinburg water mains. The Contractor shall make arrangements with the City Water Department to obtain a meter and subsequent payment for water used.

2.03. QUICKLIME (MASON'S LIME):

- A. Provide quicklime, as a dry powder in a tank, to form lime slurry.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Provide a completed course of treated materials containing a uniform lime mixture, free from loose or segregated areas, of required density and moisture content, well bound for its full depth, and with a smooth surface and suitable for placement of subsequent courses.
- B. Regulate sequence work, use proper amounts of lime, maintain the work and rework the courses as necessary to meet the requirements of this specification.

- C. Construct and shape smooth roadbed to conform to typical sections, lines and grades as shown on the plans, or as directed by the ENGINEER.
- D. Excavate materials to be treated to the proposed bottom of lime treatment grade, or secondary grade and remove or windrow to expose secondary grade.
- E. Correct any wet or unstable material below the secondary grade by scarifying, adding lime and compacting until uniform stability is achieved.
- F. Use a cutting or pulverizing machine, as applicable, to remove subgrade material accurately to secondary grade and to pulverize the material at the same time. When cutting or pulverizing machine is used, the requirement for exposing and windrowing the material is waived.
- G. Roll subgrade before use of pulverizing machinery and correct any soft areas that rolling operations shall reveal.
- H. Materials for new base and subbase shall be delivered, placed and spread in the required amount per station. The material shall be thoroughly mixed prior to the addition of lime.
- I. Lime shall be spread only on that area where first mixing operation can be completed in the same working day.

3.02 SLURRY PLACING:

- A. Mix lime, in amounts as shown on plans, or as specified by the Materials Engineering Laboratory, with water in trucks or approved distributors and apply as a thin water suspension or slurry. Provide slurry free of objectionable materials.
- B. The distribution of lime at the rates shown on the plans, as directed herein, and/or as directed by the ENGINEER, shall be attained by uniformly successive passes over a measured surface of roadway until the proper moisture and lime content is achieved.
- C. Lime slurry distributors shall be equipped with an agitator for maintaining lime and water in a uniform mixture.

3.03 DRY PLACING:

- A. Before applying lime, bring the prepared roadway to approximately optimum moisture content. Spread lime by an approved screw type spreader box or by bag distribution at the required rate shown in the plans.

- B. Distribute lime at a uniform rate with approved equipment and in such a manner as to reduce scattering of lime to a minimum. Lime shall not be applied when wind conditions, in the opinion of the ENGINEER, will cause objectionable blowing of lime to traffic or adjacent properties.
- C. Only hydrated lime may be distributed by bag. Motor graders shall not be used to spread hydrated lime.
- D. Sprinkle material until required lime content has been secured.

3.04 MIXING:

- A. Mixing procedures shall be the same for “Dry Placing” or “Slurry Placing” or lime.
- B. Treatment for Materials in Place:
 1. Thoroughly mix material and lime using approved road mixers or other approved equipment, until a homogeneous, friable mixture of material is obtained, free from all clods and lumps.
 2. Mix as thoroughly as possible at the time of lime application of materials containing plastic clay or other materials not readily mixed with lime, bring to proper moisture content, seal with a pneumatic roller, and leave to cure one to four days, as directed by the ENGINEER.
 3. During curing period, material shall be kept moist by method(s) approved by the ENGINEER.
 4. Uniformly mix, after required curing time, using approved methods.
 5. Clods in soil binder - Lime mixture shall be reduced in size by raking, blading, discing, harrowing, and scarifying or by other approved pulverization methods such that nonslaking aggregates obtained on the No. 4 sieve are removed. The remainder of the material shall meet the following requirements when test dry by laboratory sieves:

Minimum Passing 1 3/4 inch	100%
Minimum Passing No. 4 Sieve	60%

- C. Treatment of New Material
 1. Thoroughly mix and blend, using approved road mixers or other approved equipment, the base or subbase material, lime and required water until a homogeneous, friable mixture is obtained.

2. When lime is placed as slurry and mixed by use of blades, the material shall be bladed as the limewater mixture is applied.

D. During the time between application and mixing, hydrated lime that has been exposed to the open air for a period of six hours or more, or to excessive loss due to washing or blowing, shall not be accepted for payment.

3.05 COMPACTION:

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than three calendar days after final mixing.

B. Aerate or sprinkle material as required to provide optimum moisture.

C. Compaction shall begin at the bottom and shall continue until entire depth of mixture is uniformly compacted to 95% of maximum density as determined by AASHTO T-99, Method C.

D. If any portion fails to meet the density specified, it shall be reworked as required to obtain specified density.

3.06 FINISHING, CURING, AND PREPARATION FOR SURFACING:

A. Shape surface after compaction to the required lines, grades, and cross sections, followed by thorough rolling sufficiently light to prevent hair-line cracking.

B. Complete sections shall be moist cured for a minimum of two days before further coursed are added or any traffic permitted, other than sprinkling equipment.

C. The surface or compacted layer shall be kept moist until covered by other base or paving material, or until an application of CSS-1 or 55-1 emulsified asphalt as a curing seal. Curing seal shall be applied as soon as possible after final rolling at a rate of 0.05 to 0.20 gallons per square yard. The exact rate will be as directed by the ENGINEER.

D. No equipment or traffic will be permitted on lime treated materials for 72 hours after application of curing seal.

3.07 MAINTENANCE:

A. Maintain the completed lime treated material within the limits of contract, in condition satisfactory to the ENGINEER as to grade, crown and cross section until surface course is constructed.

B. Immediately repair all irregularities and defects that may occur at no cost to

the City of Edinburg and as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. When included as a separate line item, lime treatment may be measured for payment in square yards for the thickness of material shown on the plans for the surface area of completed and accepted work or lime will be measured by the ton of 2,000 pounds dry weight. Lime treatment shall be paid for at the contract unit price per square yard or paid at the contract unit cost per ton of 2,000 pounds dry weight.
- B. When not included as a separate line item, lime treatment shall be considered incidental to the completion of construction and the costs thereof shall be included in the line items provided.
- C. The contract unit price for lime treatment shall be the total compensation for preparing roadbed; for loosening, pulverizing, application of lime, water content of slurry mixture and the mixing water; mixing, shaping, sprinkling, compacting, finishing, curing and maintaining; for manipulations required, for all labor, equipment, fuels, tools and incidentals necessary to complete the work.
- D. The contract unit price for lime shall be full compensation for furnishing the material; for all freight involved; for all unloading, storing and hauling; and for all labor, equipment, fuels, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 02556 WATER TRANSMISSION LINES AND/OR PRESSURE SEWER LINES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Trenching, Backfilling and Compacting: Section 02221.
- B. Pipe Boring and Jacking: Section 02224.
- C. Valves and Appurtenances: Section 15100.

1.02 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
- C. Certificates: Manufacturer's certification that products meet specification requirements.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials on manufacturer's original skids or in original unopened protective packaging. OWNER reserves the right to reject surplus material from a different project/jobsite.
- B. Protect materials during transportation, storage, and installation to avoid physical damage.

1.04 GENERAL DESCRIPTION OF WORK COVERED

- A. Furnish and install all pipe, fittings, structures and accessories required for water transmission line and/or pressure sewer lines.

1.05 QUALITY ASSURANCE

- A. Comply with the latest published edition of American Water Works Association (AWWA) Standards:
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
 - 2. AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.
 - 3. AWWA C110 & C110a - Gray Iron and Ductile-Iron Fittings, 2-inch through

- 48-inch for Water and Other Liquids.
4. AWWA C111 - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
 5. AWWA C115 - Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 6. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 8. AWWA C153 - Ductile-Iron Compact Fittings, 3-inch through 24-inch, and 54-inch through 64-inch for Water and Other Liquids.
 9. AWWA C600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances.
 10. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 12-inch for water.
 11. AWWA C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4-inch through 8-inch.
 12. AWWA C909 - Polyvinyl Chloride (PVC) Pressure Pipe 6-inch through 12-inch for water.
 13. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe 14-inch through 36-inch for water.
- B. Comply with the latest published editions of the American Society for Testing and Materials (ASTM) Standards:
1. D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
 2. D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
 3. D 3139 - Joints for PVC Pressure Pipes using Flexible Elastomeric Seals.
 4. G 62 - Test Methods for Holiday Detection in Pipeline Coatings.
- C. Comply with the latest published editions of Plastics Pipe Institute (PPI) Standards:
1. TR2 - PPI PVC Range Composition, Listing of Qualified Ingredients.
- D. Comply with the latest published editions of Canadian Standards Association (CSA) Standards:
1. CSA B137.3 - Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- E. Comply with the latest published editions the Steel Structures Painting Council (SSPC) Standards, for Commercial Blast Cleaning.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Water Pipe: Pipe furnished shall be Polyvinyl Chloride (PVC). Ductile Iron (DI)

pipe shall be provided only where specifically identified on the Drawings or in the Specifications.

- B. Wastewater Pipe: Pipe shall be Polyvinyl Chloride (PVC) for buried service, and flanged Ductile Iron (DI) for non-buried service unless shown otherwise on the Drawings or Specifications.
- C. All pipe and fittings shall be marked in accordance with the applicable standard specification under which the pipe is manufactured unless otherwise specified.
- D. 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 and at the project site prior to and during installation. All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc. or shall be Factory Mutual approved for fire service.

2.02 POLYVINYL CHLORIDE PIPE (PVC)

A. Water Pipelines:

- 1. Pipe shall be blue in color.
- 2. Water lines 12-inch and smaller may be constructed of PVC water pipe, Pressure Class 235, in accordance with AWWA C900 (DR18) or AWWA C909.
- 3. Water lines 14-inch through 24-inch may be constructed of PVC water pipe, Pressure Rated 235 psi, in accordance with AWWA C905 (DR 18).
- 4. Water lines 30-inch and larger shall not be constructed of PVC.

B. Wastewater Pipelines:

- 1. Pipe shall be green in color.
- 2. Force mains 12-inch and smaller may be constructed of PVC pipe in accordance with AWWA C900 (Pressure Class 165, DR25), AWWA C909 (Pressure Class 150), or ASTM 2241 (Pressure Rated 160 psi, SDR 26).
- 3. Force mains 14-inch and larger may be constructed of PVC pipe in accordance with AWWA C905 (Pressure Rated 165 psi, DR 25) or ASTM 2241 (Pressure Rated 160 psi, SDR 26).

C. Where PVC pipeline is installed using non-encased, trenchless methods, the pipe shall conform to all preceding requirements for PVC pipe and may be one of the following having minimum wall thickness corresponding to DR 18:

- 1. Jointless PVC. Pipe shall conform to the requirements of AWWA C900/C905 and PPI TR2. The pipe shall be extruded with plain ends square to the pipe and free of any bevel or chamfer. Pipe shall be Fusible C900™ or Fusible

- C905™ as manufactured by Underground Solutions, Sarver, PA.
2. Restrained Joint PVC. Couplings shall be non-metallic and incorporate high-strength, flexible thermoplastic splines which shall be inserted in to mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. Couplings shall be designed for use at or above the pressure class/rating of the pipe on which they are installed, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F 477. Pipe shall be C900/RJ™ or C905/RJ™ as manufactured by CertainTeed Corporation, Valley Forge, PA.
- D. Provide push-on joints with bell integrally cast into pipe or with coupling of same material as pipe.
- E. Use elastomeric gaskets, as provided in AWWA C900 or ASTM D3139.
- F. Provide sleeve type or restraint follower glands where indicated or required to join pipe or provide restraint to offset internal or hydrostatic test pressures.
- G. All pipe shall be designed and installed with a minimum of four foot cover.
- H. PVC pipe shall be marked to indicate the following:
1. Nominal Pipe Size.
 2. Material Code Designation.
 3. Standard Dimension Ratio.
 4. Pressure Rating.
 5. Manufacturer's name or trademark.
 6. National Sanitation Foundation Seal.
 7. Appropriate AWWA or ASTM designation number.

2.03 FITTINGS FOR PVC PIPE

- A. On PVC pipelines, provide compatible fittings meeting or exceeding all requirements and ratings for the pipe on which they are installed. Use long radius fittings where possible.
1. For water lines, provide either AWWA C907 PVC or ductile iron fittings as indicated on the Drawings.
 2. For wastewater force mains, fittings shall be one of the following:
 - a. AWWA C907 PVC or 200 psi Pressure Rated PVC for 8-inch and smaller sizes.
 - b. Fabricated PVC for 10-inch through 24-inch sizes. Fittings shall be made from segments of AWWA C900, C905, or ASTM 2241 PVC pipe bonded together and over-wrapped with fiberglass-reinforced polyester.
 - c. Ductile iron on 14-inch and larger lines conforming to AWWA C905. Ductile iron fittings for wastewater service shall be coated as specified for

Ductile Iron Pipe.

2.04 DUCTILE IRON PIPE (DIP)

- A. Ductile iron push-on and mechanical joint pipe for buried service shall meet all requirements of standard AWWA C151, Class 350. Provide push-on joints unless otherwise indicated on the Drawings.
- B. Ductile iron flanged pipe for non-buried service shall meet all requirements AWWA C115. All flanged ductile iron pipe for wastewater service shall be Thickness Class 53. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by the Utility will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 250 psi.
- C. Joints shall meet all requirements of AWWA C111 for push-on, mechanical, and flanged pipe. Threaded- or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.
- D. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at the factory.
- E. Joint Materials:
 - 1. Gaskets for ductile iron pipe shall conform to AWWA C111.
 - 2. Joining of slip joint iron pipe shall be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. Pipe to be installed in areas potentially contaminated by petroleum shall have nitrile rubber gaskets. Where other contaminants are present, gaskets shall be as recommended by the pipe manufacturer.
 - 3. Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth reinforced rubber or neoprene material, preferably of deformed cross section design and shall meet all applicable requirements of AWWA C111 for gaskets. Flange gaskets shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used.
 - 4. Tee-head bolts, nuts, and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile-iron conforming to ASTM A 536; either shall be fabricated in accordance with ASTM B18.2 with UNC Class 2 rolled threads.
 - 5. Hex-head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.

6. Bolts, washers and nuts on flanged fittings shall be Grade B, ASTM A-307, 304 stainless steel. In corrosive environments such as wastewater lift station wetwells, bolts, nuts, and washers shall be 316 stainless steel and shall be coated after assembly in the same manner specified above for piping.
7. All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.

F. Polyethylene Film Wrap:

1. All iron pipe, fittings, and accessories including polyurethane coated pipe shall be wrapped with standard 8-mil (minimum) low density polyethylene film or r-fill (minimum) cross laminated high-density polyethylene conforming to AWWA C105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling.
2. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.

G. Markings: Each ductile iron pipe joint and fitting shall be marked as required by the applicable AWWA specification including the following:

1. Manufacturer's identification.
2. Country where cast.
3. Year of casting.
4. "DUCTILE" or "DI".
5. Barrels of flanged pipe shall show thickness class; others shall show pressure class.
6. The flanges of pipe sections shall be stamped with the fabricators identification.
7. Fittings shall show pressure rating and the nominal diameter of openings and the number of degrees for bends.
8. Painted markings are not acceptable.

H. Linings and Coatings:

1. Interior:
 - a. Pipe and fittings for water pipelines shall be cement-mortar lined and seal coated as required by AWWA C104. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the ENGINEER, only one type and brand of pipe lining shall be used on a given project.

- b. Pipe and fittings for wastewater pipelines shall be coated to a minimum 40 mils dry film thickness with an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Coating shall be "Protecto 401" ceramic epoxy, as manufactured by Induron Protective Coatings or equal.
2. Exterior:
- a. Buried ductile iron piping and fittings shall have a prime coat and outside asphaltic coating conforming to the applicable AWWA standard for the pipe or fitting being installed. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer and approved by the ENGINEER as resistant to the contaminants identified.
 - b. Above-ground ductile iron piping shall have a shop prime with one coat of Koppers No. 621 Rust Inhibitive Primer or equal, and a finish coat of Tnemec 75 Endura-Shield or equal.
 - c. Ductile iron piping and fittings in non-buried, corrosive environments such as wastewater lift station wetwells shall be coated as follows:
 - i) Minimum 25 mils DFT with "Ceramawrap" ceramic epoxy as manufactured by Induron Protective Coatings.
 - ii) Minimum 40 mils DFT with "Corropipe II TX-15 (AM)" as manufactured by Madison Chemical.
 - iii) Or equal.
 - d. Non-buried pipe with specified coating shall be provided with touch-up kit for field repair of damaged coating.
 - e. Pipe and fittings to receive external coating shall be shop primed or delivered to the coating applicator bear as recommended by the manufacturer of the finish coat. Pipe and fittings for non-buried service receiving asphaltic coating at any point prior to application of the specified coating are not acceptable.

2.05 DUCTILE IRON PIPE FITTINGS

- A. Fittings shall be flanged for above-ground service or mechanical joint for buried service unless otherwise indicated or approved, and shall meet all requirements of the following standards:
 - 1. AWWA C110 or AWWA C153 (buried service only).
 - 2. AWWA C111.
- B. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings.
- C. Where long radius bends are indicated, fittings shall have center-to-face and radius dimensions according to the ANSI B16.1 Class 125 standard for long radius bends, and shall conform to all other applicable requirements of AWWA C110 including pressure rating.

- D. Shall be compatible with joint type of adjacent pipe.
- E. Provide all specials, taps, plugs, flanges and wall fittings as required.
- F. Linings and coatings for ductile iron fittings shall be as specified for ductile iron pipe.

2.06 VALVES, HYDRANTS, METERS AND APPURTENANCES

A. For valve requirements refer to Section 15100.

B. Valve Boxes:

- 1. Provide for all buried valves.
- 2. Use nominal 6 inch cast-iron sliding type pipe shaft with cover and base casting.
- 3. Set box top at finished grade.
- 4. Furnish drop cover appropriately marked "WATER".

C. Corporation Stops:

- 1. Conform to AWWA C800.
- 2. Use 3/4 inch unless indicated otherwise.

D. Hydrants:

- 1. Design: latest edition of AWWA C502, traffic model with break flange.
 - a. Mueller Centurion - A423
 - b. American-Darling - B-84-B
 - c. Kennedy Guardian - K-81A
 - d. U.S. Pipe – Metropolitan
 - e. Others as approved by OWNER in writing
- 2. Provide 6 inch inlet, 2 - 2> inch hose nozzles, 1 - 4> inch pumper.
- 3. Provide compression type main valve, minimum size 5< inches.
- 4. Pentagon operating nut.
- 5. Design to open counterclockwise.
- 6. Provide mechanical joint bell on foot piece.
- 7. Furnish depth as noted on plans.
- 8. Furnish National (American) Standard Fire Hose Coupling Screw Thread (NH).

E. Polyethylene Wrapping:

- 1. Material: AWWA C105.
- 2. Thickness: 8 mils.

F. Polyethylene Plastic Pipe (PE):

1. Material: ASTM D2737.
2. Fittings: ASTM D2683.
3. Size: 3/4 inch unless shown otherwise on plans.

G. Copper Pipe (CU):

1. Material: seamless, Type K, ATM B88.
2. Fittings: wrought copper solder joint or flared.
3. Size: 3/4 inch unless shown otherwise on plans.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide all labor, equipment and materials, and install all pipe fittings, specials and appurtenances as indicated or specified.

3.02 PIPE INSTALLATION

A. Handling:

1. Handle in a manner to insure installation in sound and undamaged condition.
 - a. Do not drop or bump.
 - b. Use slings, lifting lugs, hooks and other devices designed to protect pipe, joint elements, and coatings.
2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

B. Installation:

1. Install pipe with orientation of labeling point upward.
2. Utilize equipment, methods, and materials insuring installation to lines and grades as indicated.
3. Do not lay piping on blocks unless pipe is to receive total concrete encasement.
4. Accomplish horizontal and vertical alignment adjustments with fittings or deflection of joints.
 - a. Limit joint deflection:
 - (1) Conform to AWWA C600 for ductile iron pipe.
 - (2) Not more than 80% of pipe manufacturer's recommended maximum for PVC pipe.

- b. Use short specials preceding curves as required.
 - c. Obtain approval of ENGINEER of method proposed or transfer of line and grade from control to the work.
5. Install pipe of size, material, strength class, and joint type with embedment as shown on the Drawings or specified herein.
6. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
 - a. Close open ends of pipe with snug fitting closures.
 - b. Do not let water fill trench. Prevent flotation of pipe where potential for trench flooding is present.
 - c. Remove water, sand, mud and undesirable materials from trench before removal of end cap.
7. Inspect pipe prior to installation to determine if any pipe defects are present.
8. Brace or anchor as required to prevent displacement after establishing final position.
9. Perform only when weather and trench conditions are suitable. Do not lay pipe in water.
10. Observe extra precaution when hazardous atmospheres might be encountered.
11. Sanitary sewer separation distance from water lines:
 - a. Conform to all TCEQ requirements for separation.
 - b. Maintain 9-foot horizontal separation whenever possible.
 - c. When conditions prevent a lateral separation of 9 feet, water line may be installed closer to a sewer subject to the following conditions:
 - (1) Crossings: Sewer shall be constructed of PVC pipe meeting the requirements specified above for pressure sewer lines and have a minimum working pressure rating of 150 psi or greater for pipe and fittings. The water line may be placed no closer than 6 inches from the sewer. The separation distance shall be measured between the nearest outside pipe diameters. The water line shall be located at a higher elevation than the sewer line whenever possible and one length of the sewer pipe must be centered on the water line;
 - (2) Parallel Alignment: the water line shall be separated by a minimum vertical distance of 2-feet (water above sewer) and a minimum horizontal distance of 4-feet, measured between the nearest outside diameters of the pipes.
12. Separation of water lines from sewer manholes:
 - a. No water pipe shall pass through or come in contact with any part of a sewer manhole.
 - b. A minimum horizontal separation of 9 feet shall be maintained.
13. Construct service lines where shown on plans in accordance with Standard Detail Drawing. Use pipe material specified on plans or in contract documents.
14. Wrap ferrous pipe, fittings and tie rods with polyethylene where shown on plans in accordance with AWWA C105.

C. Jointing:

1. General requirements:
 - a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and within 18 inches of structure walls.
 - b. Perform in accordance with manufacturer's recommendations.
 - c. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
 - d. Utilize methods and equipment capable of fully homing or making up joints without damage.
 - e. Check joint opening and deflection for specification limits.
2. Special provisions for jointing ductile iron pipe:
 - a. Conform to AWWA C600.
 - b. Visually examine while suspended and before lowering into trench.
 - (1) Paint bell, spigot, or other suspected portions with turpentine and dust with cement to check for cracks invisible to the eye.
 - (2) Remove turpentine and cement by washing when test is satisfactorily completed.
 - (3) Reject all defective pipe.
3. Special provisions for jointing and laying PVC pipe:
 - a. Conform to AWWA C600 and ASTM D2321.
 - b. Allow pipe to reach trench soil temperature prior to installation in ditch.

D. Cutting:

1. Cut in neat workmanlike manner without damage to pipe.
2. Cut cast-iron with Carborundum saw or other approved method.
 - a. Smooth cut by power grinding to remove burrs and sharp edges.
 - b. Repair lining as required and approved by Engineer.

E. Closure Pieces:

1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.
3. May be accomplished with sleeve coupling of rating equal to or greater than that of pipe:
 - a. Of length such that gaskets are not less than 3 inches from pipe ends.
 - b. Include spacer ring identical to pipe end such that clear space does not exceed 1/4 inch.

F. Temporary Plugs:

1. Install whenever installed pipe is left unattended.

2. Use water-tight plug rated for 150 psi or greater.

G. Joint Restraint:

H. Thrust Blocks:

- a. Provide for all horizontal or vertical bends.
- b. Use on all dead-ends, tee fittings, and changes in pipe diameter.
- c. Install as indicated on Standard Detail Drawing.
- d. Construct to undisturbed edge of trench for bearing.
- e. Mechanical joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms or sand bags shall be provided for thrust blocks.
- f. Provide minimum bearing area in square feet. based on 150 psi test pressure and 2000 psf soil bearing capacity listed in the following table:

Pipe/Tee Size	Tee/Dead Ends	11¼° Bend	22¼° Bend	45° Bend	90° Bend
4"	1.4	0.3	0.5	1.0	1.9
6"	2.8	0.5	1.1	2.1	4.0
8"	4.8	0.9	1.9	3.7	6.8
10"	7.3	1.4	2.8	5.6	10.3
12"	10.3	2.0	4.0	7.9	14.5
14"	13.8	2.7	5.4	10.6	19.5
16"	17.8	3.5	7.0	13.6	25.2

- g. Adjust thrust block areas accordingly if pressures and/or soil bearing capacity varies.

3. Restraint follower glands for use with mechanical joint fittings shall be used in addition to thrust blocks where indicated on the Drawings. Restraint gland shall have torque limiting twist-off nuts and shall meet the requirements of ASTM 1674-96 for use with PVC pipe and be equal to "MEGALUG®" as manufactured by EBAA Iron, Eastland, TX.

- I. After installation, non-buried pipe shall be visually inspected for damage to protective coating and repaired using coating manufacturer's repair kit.

3.03 VALVE AND APPURTENANCE INSTALLATION

A. Valves:

1. Install with stems vertical when installation is horizontal.
2. Set valves on concrete thrust block having four (4) square feet of bearing area on undisturbed earth.

B. Valve Boxes:

1. Center on valves.
2. Carefully tamp earth around each valve box to a distance of 4 feet on all sides of box or to undisturbed trench face, if less than 4 feet.

C. Hydrants:

1. Set hydrants where shown on plans in accordance with Standard Detail Drawing.
2. Install gravel, blocks and anchors in accordance with Standard Detail Drawing.
3. Set reference elevation 3 inches above existing grade or to elevation established by ENGINEER (not to exceed 6 inches).
4. Break-a-way flange to be either ground level where applicable or between 3 inches and 6 inches above curb as established by Engineer.

3.04 ACCEPTANCE TESTS FOR PRESSURE MAINS

A. Perform hydrostatic pressure and leakage test.

1. Conform to AWWA C600 procedures.
 - a. As modified herein.
 - b. Shall apply to all pipe materials specified.
2. Perform after backfilling.

B. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.

1. Contractor to furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs, at no additional cost to the Owner.
2. Contractor responsible for any damage to public or private property caused by failure of plugs.

C. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.

D. OWNER will make water for testing available to contractor at nearest source. **Valves of existing water system will at all times be operated by City personnel only.**

E. Pressure test:

1. Conduct at pressure at least 1.5 times the normal working pressure (not less than 150 psi test pressure).

2. Maintain pressure for a minimum of two (2) hours.
3. Test pressure shall not vary by more than +5 psi

F. Leakage Test:

1. Conduct concurrently with the pressure test.
2. Maintain pressure for a minimum of two (2) hours.
3. Acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{N \square D \square P^{0.5}}{7400}$$

L = Maximum permissible leakage in gallons per hour.

N = Number of pipe joints in segment under test.

D = Nominal internal diameter of pipe being tested in inches.

P = Average actual leakage test pressure, psig.

4. Repeat leakage test as necessary:
 - a. After location of leaks and repair or replacement of defective joints, pipe or fittings.
 - b. Until satisfactory performance of test.
 - c. At no increase in cost to the OWNER.

G. Refit and replace all pipes not meeting the leakage or pressure requirements. Repair clamp is not permitted.

H. Repair all visible leaks regardless of the amount of leakage.

I. OWNER or ENGINEER will observe all tests.

3.05 DISINFECTION OF PIPELINES FOR CONVEYING POTABLE WATER

A. CONTRACTOR to provide all equipment and materials and perform in accordance with AWWA C601.

1. As modified herein.
2. Include chlorination and final flushing.

B. Add chlorine to attain an initial concentration of 50 mg/l chlorine with 10 mg/l remaining after 24 hours.

C. Flush main until concentration is 2 mg/l or less prior to placing main in service.

D. Obtain approval of materials and methods proposed for use.

- E. May be conducted in conjunction with acceptance tests.
- F. Dispose of flushing water without damage to public or private property.
- G. Repeat disinfection procedure should initial treatment fail to yield satisfactory results.
 - 1. At no additional cost to the OWNER.
 - 2. OWNER will provide water under terms specified for acceptance tests.
- H. Do not exceed 500 gpm rate in flushing.
- I. Provide safe bacterial sample results before placing main into service.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRESSURE LINES

- A. Line shall be measured along the center of the pipe without considering fittings or other pipe connections. The line will be paid at the contract bid price per linear foot.
- B. Compensation will be for furnishing all materials, labor, equipment, tools and incidental work required by the construction of the pressure line, all in accordance with the plans and these specifications.
- C. If pressure line fails any test procedure, trouble spot is to be corrected all as incidental to the construction of the pressure line.

END OF SECTION

SECTION 02558 WATER VALVES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of furnishing and installing valves as indicated on the plans or as directed by the ENGINEER in accordance with these specifications.
- B. Unless otherwise noted, all valves 4 inches and larger shall be AWWA-type valves of suitable design and fully equipped for service buried in the earth, without need for further modification and shall be wrapped with 8 mil polyethylene film with all edges and laps securely taped to provide a continuous wrap.
- C. Valve ends on valves 4 inches and larger shall be flanged or mechanical joint. All mechanical joints shall conform to AWWA Specification C111. Flanges shall be dimensioned, faced, and drilled to the 125 pound "American Standard".
- D. Valves shall be carefully installed in their respective positions, accessible for operation and repair. Unless shown on the plans otherwise, valves shall be of the same sizes as the pipelines in which they are installed. Stems shall be installed pointing straight upward. The operating nuts of all valves or valve stem extensions shall be no deeper than 18 inches below the top of the valve box cover. Valves shall be left in satisfactory operating condition, free from all distortion and strain.
- E. All valve operators shall turn in a counterclockwise direction to open the valve.

PART 2 - PRODUCTS

2.01 VALVE TYPES

A. Gate Valves

- 1. Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans.
- 2. Resilient seat gate valve shall be used and shall conform to AWWA C509. The gate valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall have a standard hub equipped with a square operating nut. The body-to-bonnet and bonnet-to-bonnet cover shall use "O" rings as seals.
- 3. The resilient seat shall be mechanically retained or bonded on the valve gate

(wedge disc).

4. The gate valve shall have protective coating inside and outside of fusion bonded epoxy approved for potable water.
5. The valve stem shall comply with AWWA C509. The material for the valve stem shall be brass or bronze, and shall have a minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi. The valve stem shall be compatible and interchangeable with the equivalent sized double disc gate valve models.
6. Gate valves shall have a 2-inch square operating hub nut.
7. The number of turns to open the valve shall be the same or less than the equivalent sized double disc gate valve models. Maximum input torque to open and/or close the valve shall be 200 foot pounds for a 4-inch valve and 300 foot pound for a 6 inch under a working pressure of 200 psi.
8. Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card".
9. Gate valves shall be American Darling, Metroseal by U.S. Pipe, Mueller, or approved equal.

B. Rubber seated Butterfly Valves

1. Butterfly valves will be used in lieu of gate valves for sizes of 14 inches and larger, the butterfly valve shall be of the rubber-seated tight closing type conforming to AWWA C504.
2. The valve body shall be cast iron having integral hubs for the housing shaft bearings and seals. The body ends shall be flanged per AWWA C504 with the flanges designed for installation between Class 125 cast iron flanges or mechanical joint meeting the requirements of AWWA C111.
3. The butterfly valve disc shall be cast iron.
4. The seat shall be bun rubber and shall be mechanically retained on the disc edge by means of 18-8 stainless steel bolts. Seat must also be capable of being replaced in the field without chipping, grinding, or burning out of the old seat or retaining substance. The body seat mating surface shall be 18-8 stainless steel, type 304 mechanically retained.
5. Valve shafts shall be 18-8 stainless steel, type 304 and shall be securely attached to the disc by means of bolts, dowel pins, or taper pins.

6. All butterfly valves shall be side operated. Valve actuator shall be integrally mounted on the valve mounting flange and shall be of the self locking traveling nut type in complete accordance with AWWA C504 requirements. Actuators shall be furnished with a standard 2 inch operating nut and must be designed to permit the adjustment of the valve disc seating without the removal of the housing cover.
7. All butterfly valves shall be tested per AWWA C504
8. Before the work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card".

C. Valve Stem Extensions

1. Extension stems shall be provided as necessary to situate the operating nut no greater than 18 inches below the valve cover.
2. Extension stems shall be equipped with stem guides affixed to the valve box at intervals not to exceed ten feet.
3. Stem guides shall be considered a part of the extension. Extension stems and stem guides shall be manufactured items or approved equal.

D. Air and Vacuum Valves

1. Air and vacuum valves shall be of the type that automatically exhaust large quantities of air during the filling of a pipeline and allow air to re-enter enduring draining or when a negative pressure occurs.
2. The inlet and outlet of the valve shall have the same cross-sectional area. The floats shall be guided by a stainless steel guide shaft and seat against a synthetic seat.
3. Valves shall have NPT inlets and outlets.
4. All air and vacuum valves shall be constructed of cast iron with stainless steel trim and bun seating. Valves shall be as manufactured by Val-Matic Valve & Mfg. Corp., Series 100.

E. Fire Hydrants

1. Fire hydrants and their extensions shall be in accordance with AWWA C502, traffic type.
2. Fire hydrants shall have one 5 1/4 inch diameter valve opening; 6-inch

mechanical joint of slip on inlet connection; two 2 1/2 inch hose nozzle connections; and one 4 1/2 inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads or as specified by the OWNER.

3. Fire hydrants shall have a bronze or cast iron, pentagon, operating nut, be designed for 150 psi., working pressure service, and have a normal bury of 4 to 4 1/2 feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.
4. The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the streets' centerline or radially on a curvilinear installation.
5. Fire hydrants shall be installed in as near a vertical position as possible and shall have no more than 1/2 inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.
6. Hydrants shall be dry barrel, post-type with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring or bronze or cast iron bushing.
7. Hydrant interior and exterior below the ground line shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer.
8. The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6-inch mechanical joint connection. The inside shall be epoxy coated to prevent corrosion.
9. The nozzle shall be threaded in place and retained by stainless steel locks.
10. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.
11. Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.
12. Fire hydrant shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.
13. No project will be accepted by the OWNER until all hydrants are operational, accessible and have been tested by the Edinburg Fire Department.

14. Before the work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Fire Hydrant Data Card".
15. Hydrants shall be limited the following unless prior written approval is provided by the ENGINEER:
 - a. Mueller Centurion A-423
 - b. American Darling B-84-B
 - c. Kennedy Guardian K-81A
 - d. U.S. Pipe Metropolitan

F. Valve Boxes

1. Valve boxes, rings and covers shall be the type, size and materials shown in Standard Detail drawings.
2. No valve box shall be paved over without the permission of the ENGINEER. Paving material shall not remain on valve box covers overnight.
3. Valve boxes shall be fabricated using 6 inch cast-iron sliding type pipe shaft with cover and base casting.
4. Drop covers for vale boxes shall be marked "water" using lettering casted in the cover by the manufacturer.
5. Top of valve box shall be set at finished grade unless otherwise noted.

2.02 WATER VALVE DATA CARD

- A. Water Valve Data Card, as shown on Figure 02558-1 and 02558-2, shall be prepared for all types of valves (Gate Valves, Butterfly Valves, Air Release Valves, etc) according to the following instructions:
 1. The Valve Number will be assigned by the OWNER at a later date.
 2. Vale Size is the nominal diameter of the valve, i.e., 6 inch, 14 inch, or 48 inch. In the case of compound valves give size of main valve and by-pass valve, i.e., 24 inch and 4 inch, or 36 inch and 6 inch.
 3. Valve Type is the general description of the valve, such as: Vertical Gate Valve, Horizontal Gate Valve, Vertical Gate Valve with by-pass, Horizontal Gate Valve with by-pass, Butterfly Valve, G lobe Valve, Check Valve, etc.

4. Make and Model refers to the manufacturer, make and model number to identify the valve for replacement parts, such as Mueller No. A-2308-6. This information should be available from the shop drawings.
5. Number of Turns and Direction to Open is the number of revolutions for the operating nut to make the valve travel from fully closed to fully open, and the direction is either clockwise or counter-clockwise, i.e., 54 turns counter-clockwise. All standard valves shall open counter-clockwise. Operation, turn count, and direction to open will be verified by the ENGINEER prior to installation.
6. Under Project Name is the assigned work order number or name shown on plans.
7. Date Warranty expires is the expiration date, under the contract, for requiring warranty repairs.

END OF SECTION

SECTION 02574 FIBERGLASS MANHOLES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work consists of materials for and the installation of manholes for sanitary sewer systems.
- B. Manholes shall be constructed in accordance with the design and details shown on the plans and as hereinafter provided.
- C. Invert elevations shall not vary more than 0.05 feet from the grade designated by the ENGINEER.
- E. Manholes will not be constructed with cast in place steps. Where steps are required by the ENGINEER, the steps will be installed after the manhole has been constructed. The step used shall be a 1/2" grade 60 steel reinforcing rod in capsulated in a co-polymer polypropylene as manufactured by M.A. Industries, Inc. (Model #P-2-PFS) or equal as approved by the ENGINEER. Installation of the steps shall be as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All cement used shall be Type II Portland Cement.
- B. All manhole foundations or bases shall be concrete and constructed as shown on the plans and in no case shall the thickness be less than 6 inches.

2.02 BRICK MANHOLES:

- A. Unless otherwise specified, manholes described herein shall be constructed of grade MS Brick and Type M Concrete Mortar.

2.03 CONCRETE MANHOLES:

- A. Precast Manholes & Sections
 - 1. Construct eccentric or concentric top manholes as indicated of precast pipe on conformance with ASTM C-478 using Type II Portland Cement.
 - 2. Provide factory block-outs at base or cast-in-place rubber gasket for connection of required sewer line.
 - 3. Minimum wall thickness will be 1/2 inch.

4. Concrete in foundation shall comply with Section 03300 - Cast-in-Place Concrete.
5. Reinforcing steel shall comply with Section 03330 - Reinforcing Steel.

B. Cast-in-Place Manholes

1. Concrete shall comply with Section 03300 - Cast-in-Place Concrete.
2. Reinforcing Steel shall comply with Section 03330 - Reinforcing Steel.
3. Minimum wall thickness will be 5 inches.
4. Provide cast-in-place rubber gasket for connection of required sewer line.

C. Precast Concrete Manhole Bases

1. Precast concrete manhole bases may be used when approved by the ENGINEER. If approved, it shall be with the understanding that the CONTRACTOR shall be responsible for placing the bases at the specified elevation, location, and alignment.
2. Precast bases shall be manufactured with cast-in-place sewer pipe gaskets, such as: "A-LOK" or approved equal.

2.04 COATING OF MANHOLES:

A. Exterior of Manholes

1. If required, the coating shall be a waterproofing type of bitumastic or asphaltic material, as approved by the ENGINEER.
2. Application shall be in accordance with the manufacturer's published recommendations.

B. Interior of Manhole

1. If required, drain manhole coating shall be an epoxy type material conforming to Section 02590 - Polyurethane Protective Coatings.
2. All sanitary sewer manholes shall require two coating applications of Inertal Standard as manufactured by the Inertal Company, Inc. or equal as approved by ENGINEER.

C. Plastering of Manholes

1. The work shall include the coating of the surface of existing brick or block manholes with plaster as required on the plans or directed by the ENGINEER.

2.05 FRAMES, GRATES, RINGS AND COVERS:

A. Welded Steel

1. Welded steel grates and frames shall conform to the member, size, dimensions and details indicated and shall be welded into an assembly in accordance with those details.
2. Steel shall conform to the requirements of ASTM A 36.

B. Castings

1. Castings whether Gray Cast Iron or Ductile Iron shall conform to the shape and dimensions required and shall be clean substantial castings, free from sand or blowholes or other defects. Surfaces of the castings shall be free from burnt on sand and shall be reasonably smooth.
2. Runners, risers, fins and other cast on pieces shall be removed from the castings and such areas ground smooth.
3. 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 area of contact.
4. Pairs of machined castings shall be match marked to facilitate subsequent identification at installation.
5. Steel castings shall conform to ASTM A 27, "Mild to Medium Strength Carbon Steel Castings or General Application." Grade 70-36 shall be furnished unless otherwise specified.
6. Cast iron castings shall conform to ASTM A 48, "Gray Iron Castings," Class 30.
7. Ductile Iron castings shall conform to ASTM A 536, "Ductile Iron Castings." Grade 60-40-18 shall be used unless otherwise specified.

C. Rings

1. Adjusting rings shall conform to ASTM A 536, "Gray Iron Castings."

D. Nuts and Bolts

1. Commercial grade galvanized nuts and bolts shall be as indicated. The zinc coating shall be uniform in thickness, smooth, and continuous.

E. Mortar

Mortar for bedding castings shall consist of 1 part cement and 3 parts sand meeting the requirements of fine aggregate Grade No. 1 in Section 03300 - Cast-In-Place Concrete.

F. Manhole Accessories

1. Manhole lid and cover:
 - a. Gray cast iron, with minimum clear opening 32-inches.
 - b. Use Neenah R-1916-F or approved equal for bolted covers.

- c. Use Neenah R-1670-D or approved equal for lids not requiring bolting features.
 - d. Provide anchor bolt holes for exposed manhole tops.
2. Manhole Rings - provide minimum of three throat rings between cone and manhole lid and cover.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Foundations shall be poured in place.
- B. Construct manhole foundation and channel inverts integrally. See Plan details.
- C. Precast manhole sections may be installed after foundation concrete has attained 75% of design strength.
- D. Forms for cast-in-place manhole may be installed after foundation concrete has attained 75% of design strength.
- E. Manhole foundation and manhole may be installed simultaneously if manhole section is supported on concrete blocks and foundation concrete placed under and around bottom section.
- F. Completely fill joints with pre-formed plastic gasket.
- G. Heat materials in freezing weather and protect work from cold; maintain temperature of work at 40° F. for at least 24 hours after placing.
- H. Invert Channels:
 1. Form invert channel as required.
 2. Make changes in direction of flow with smooth curves of as large a radius as size of manhole permits.
 3. Make changes in size and grade smoothly and uniformly.
 4. Slope floor of manhole adjacent to channel and drain thereto.
 5. Finish channel bottom smoothly without roughness, irregularity, or pockets.
- I. Pipe Connections:
 1. Make watertight.
 2. Use rubber gasket.
 3. All connections shall be at flowline of manhole, unless otherwise required.
- J. Exterior Pipe Support:

1. Support vitrified clay pipe on concrete cradle from manhole connection to first joint.
2. Provide first pipe joint within 18 inches of manhole wall.

K. Castings, frames, and fittings:

1. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is place.
2. The unit shall be protected until mortar or concrete is set.

L. Coatings shall be applied after ENGINEER's approval of structure.

M. Soil foundations, one foot beyond perimeter of concrete to base shall be compacted to a depth of one foot to 95% maximum density of ASTM D 1557.

3.02 BRICK MANHOLES:

- A. Brick shall be clean, saturated surface dry before laying and shall be laid on a full mortar bed with "push joints."
- B. In no event will shushing or grouting of a joint be permitted nor shall a joint be made by working in mortar after the brick has been laid.
- C. Joints between the courses of bricks in manholes and other structures shall be as nearly as possible to a uniform thickness of 3/8 inch.
- D. The inside and outside of all brick sewer structures shall be neatly plastered with Type M mortar 1/2 inch thick and cured.
- E. Brick work shall not be laid upon a concrete foundation less than 24 hours after such foundation has been poured.
- F. No brick work shall be laid in water nor, except as prescribed for curing, shall water be allowed to stand or run on any brick work until the mortar has thoroughly set.
- G. Where new work is joined to existing unfinished work, the contact surfaces of the latter shall be thoroughly cleaned and moistened.

3.03 CONCRETE MANHOLES

- A. Manholes constructed of poured concrete (reinforced or non-reinforced) or precast reinforced concrete risers and tops shall comply with the requirements of ASTM C 478.

- B. Circular precast manhole sections shall be provided with a rubber or mastic gasket to seal joints between sections.
- C. All lifting holes, except Type "C" manhole cover lids, and gaps at joints shall be filled with a non-shrink grout.

3.04 ABANDONMENT OF MANHOLES:

- A. Abandonment of manhole, which is part of a sewer line being abandoned, shall entail the following work and materials.
 - 1. Manhole will not be removed but will be abandoned in place.
 - 2. All manhole inlet and outlet lines shall be plugged with a 12-inch long concrete mortar plug.
 - 3. Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to inspect the materials for usability. Salvageable materials shall be transported for usability. Salvageable materials shall be transported by the CONTRACTOR to the OWNER'S storage yards. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project.
 - 4. Unusable material will be removed from the project site and properly disposed of by the CONTRACTOR.
 - 5. Manhole bottom will be thoroughly pulverized, as directed by the ENGINEER.
 - 6. The manhole shall be filled with cement treated base (CTB) material to the top of the proposed subgrade of the pavement or to the ground surface finished grade.
 - 7. All labor, materials and equipment necessary to complete this work shall be furnished by the CONTRACTOR.

3.05 MANHOLE REHABILITATION IN REPLACEMENT WORK:

- A. The work under this item shall be to replace the existing manhole frame and cover and to place a concrete pad around the existing manhole as required per the construction plans.
- B. This work will be done when an existing manhole is encountered in the normal course of the replacement work that has a light weight, vented, multi-holed manhole cover.
- C. This work shall include the following:
 - 1. Remove any and all existing brick under frame and replace with new Grade MS brick as necessary to bring new frame and cover to street grade.

2. Remove and replace existing concrete pad, or construct a new pad around the collar.
 3. Remove existing manhole steps and if manhole is greater than 10 feet deep, new steps will be installed.
 4. Remove and repair pavement.
 5. Excavation and compaction of backfill as required.
 6. All materials, labor and equipment necessary to do the work under this item shall be furnished by the CONTRACTOR.
- D. The work and materials under this item shall be done according to the manner set forth in the plan details and other sections of these specifications.
- E. Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR to the OWNER's Storage Yards. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be properly disposed of by the CONTRACTOR.

3.06 MANHOLE DATA SHEET:

- A. Before this work is accepted, the CONTRACTOR shall provide to the ENGINEER a completed manhole data sheet for each new manhole constructed.
- B. Manhole data sheet as shown in Exhibit 02575-1 will be completed in accordance with the following instructions:
1. A Manhole Data Sheet will be prepared for each manhole constructed.
 2. The original copy of the Data Sheet will be filed with the ENGINEER. Distribution of copies will be made to all interested parties.
 3. The Manhole Number will be assigned by the OWNER.
 4. Manhole Type is the general description of the manhole, e.g.: 6 foot diameter Type C, or 4 foot diameter Type E as per plan details.
 5. Manhole cover Size is the nominal diameter of the manhole cover. Type, Model and Pattern refers to the manufacturer, material made of, model number and design pattern to identify the identical manhole cover for replacement.
 6. Section 3 requires the name of the CONTRACTOR, the name of the foreman, and the name of the inspector actually responsible for the construction of the manhole.
 7. Under "Project Name" is the work order number under this contract.
 8. Date Warranty Begins is the official date of acceptance of the Project or portion of the Project of which this manhole was a part.
 9. Data Warranty expires is the expiration date under the Contract for requiring warranty repairs.

10. Street Location: Give both blocks number and street name. For manholes in intersections give both streets. The "Remarks" section may be used for further clarification of manhole location.
11. Disregard the section on coordinate location. To be filled in by the OWNER at a later date.
12. All applicable items on the Manhole Data Sheet should be filled in. However, accuracy is more important than filling in blank spaces. Therefore, if an item is unknown and cannot be determined, leave the space blank.

**EXHIBIT 02575 - 1
MANHOLE DATA SHEET**

SECTION 1

Manhole Number:
Manhole Type:
Date Installed:
Project Name:

SECTION 2

Manhole Cover Size:
Manhole Cover Type & Model:
Manhole Pattern:
Number of Rings Used:

SECTION 3

Contractor's Name:
Foreman's Name:
City Inspector's Name:

SECTION 4

Date Warranty Begins:
Date Warranty Expires:

SECTION 5

Street Location:
Intersection Location:
Remarks:

SECTION 6

Rim Elevation:
Invert Elevation:

SECTION 7 (To be completed by owner)

COORDINATE LOCATION

POINT	X (East) Departure	Y (North) Departure	Z Elevation
Center Manhole Invert:			
Center Manhole Cover:			
Electronic Marker Disc:			

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. New Manholes

1. Manholes of specified diameters shall be measured per each unless otherwise directed on the Bid Proposal Form and Measurement and Basis for Payment sheet.

B. Elevation Adjustments

1. When a new manhole is installed, no measurement or payment will be made for rim elevation adjustments to conform to proposed surface grades.
2. The following measurements for rim elevation adjustments on existing manholes will be made as follows:
 - a. Adjustment to a manhole frame by the addition of adjustment rings (s) will be measured per each manhole adjusted and incidental to that manhole item.
 - b. Leveling brick adjustment will be measured per each manhole adjusted and incidental to that manhole item.
 - c. Adjustment of manhole cone or barrel will be measured per each manhole adjusted and incidental to that manhole item.

C. Manhole Coating

1. If required, exterior coating of manholes will not be measured and will be considered incidental to the appropriate manhole.
2. Plastering of the interior of manholes will be considered incidental to the appropriate manhole.
3. Polyurethane protective coatings will be measured as provided in Section 02590 - Polyurethane Protective Coatings.
4. Protective Inertial coatings for sanitary sewer manholes shall not be measured for payment.

D. Manhole Steps

1. If required, manhole steps will not be measured and will be considered incidental to the appropriate manhole.

E. Abandonment of Manholes

1. Abandonment of manholes will be measured per each for the work specified.

F. Manhole Rehabilitation

1. Manhole rehabilitation will be measured per each for the work specified.

4.02 PAYMENT:

A. New Manholes

1. Manholes of specified diameters with depths of 6 feet or less shall be paid for at the contract unit price per each manhole.
2. Manholes of specified diameters with depths greater than 6 feet shall be paid for at the contract unit price per each manhole as in 4.02 A.1 above.
3. Payment for manholes of any diameter and depth will include: excavation, compacted backfilling, shelving, cover or cone, leveling bricks, frame and cover, and concrete pad or collar.

B. Elevation Adjustments

1. The following payments for accepted quantities of rim elevation adjustments on existing manholes will be as follows:
 - a. Adjustment of a manhole frame by addition of adjustment ring(s) will be paid for at the unit contract price per each manhole adjusted.
 - b. Leveling brick adjustment will be paid for at the unit contract price per each manhole adjusted.
 - c. Adjustment of manhole cone or barrel will be paid for at the unit contract price per manhole.

C. Manhole Coating

1. If required, no direct payment shall be made for coating of the exterior of manholes and will be considered incidental to the appropriate manhole.
2. Plastering of the interior of manholes will be paid for at the unit contract price per manhole.
3. Polyurethane protective coatings will be paid for as provided in Section 02590 - Polyurethane Protective Coatings.

D. Manhole Steps

1. If required no direct payment shall be made for manhole steps, where required, and will be considered incidental to the appropriate manhole.

E. Payment for abandonment of manholes will be paid for at the unit price per each for the work specified.

F. Payment for manhole rehabilitation will be paid for at the unit price per each for the work specified.

- G. If required, the following items will be included in the unit price per appropriate adjustment: pavement removal and repair, excavation, compacted backfill, concrete collar or pad, leveling bricks, adjusting rings, and frame and cover.
- H. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required including polyurethane protective coating if not included as a separate pay item in this contract. All in accordance with the plans and specifications herein.

END OF SECTION

SECTION 02580 STORM SEWER APPURTENANCES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of furnishing and installing appurtenances except manholes, for storm sewers in accordance with details on the plans and as specified herein as directed by the ENGINEER.
- B. The various types of structures and appurtenances such as inlets, headwalls, energy dissipaters, etc. are designated on the plans by letters or by numbers indicating the particular design of each. Each type shall be constructed in accordance with the details indicated and to the depth required by the profiles and schedules given.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. The construction plans will specify the size and material for the pipe between the storm sewer main and the storm water collection structure.
- B. The various types of storm inlets and their relation to curb and gutter, or valley gutter are shown on the Standard Detail Drawings. Construction plans will identify the type to be constructed.
- C. Grating size, material, and configuration shall conform to the Standard Detail Drawings.

2.02 MATERIALS:

A. Concrete

- 1. Concrete for cast in place miscellaneous structures shall be Class A concrete when used with precast pipe sewer construction and Class C concrete when used with monolithic pipe sewer construction.
- 2. Concrete for precast structures shall be 3000 psi and comply with the applicable requirements of ASTM C 478.

B. Mortar:

- 1. Mortar shall be composed of 1 part Portland Cement and 2 parts clean, sharp mortar sand suitably graded for the purpose by conforming in other respects to the provisions of Section 03300 for fine aggregate.

2. 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.

C. Reinforcement:

Reinforcing Steel shall conform to Section 03330.

D. Brick:

1. Bricks shall be of first quality, sound, hard-burned brick. Shale bricks, if used, shall be homogeneous, thoroughly and uniformly burned.
2. Bricks shall not absorb more than 17 percent of water by weight submerged in water for 24 hours, having been in a completely dry state prior to placing in water.
3. Clay brick shall conform to the requirements of ASTM C 62, Grade SW. concrete brick meeting the requirements of ASTM C 55, Grade A, shall be acceptable.

E. Concrete Block:

Concrete blocks when indicated shall conform to ASTM C 139.

F. Frames, Grates, Rings and Covers:

Frames, grates, rings and covers shall conform to Section 02571.

G. Miscellaneous Items:

Cast iron for supports, steps and inlet units shall conform to the shape and dimensions indicated. The casting shall be clean and perfect, free from sand or blow holes or other defects. Cast iron casting shall meet the requirements of ASTM A 48, Class 30. Steel for temporary covers when used with Stage Construction shall be adequate for the loads imposed.

PART 3 - EXECUTION

3.01 INSTALLATION OF DRAINAGE FACILITIES:

- A. Excavation and backfilling for the storm inlet shall be accomplished in accordance with Section 02227.
- B. Trenching, backfilling and compaction for the connecting pipe between the storm sewer main and the storm inlet shall conform to the specifications contained in Section 02221. Pipe shall be installed in accordance with Section 02590.
- C. All pipe and structures shall be installed per location and elevations, as shown on the construction plans. If during the course of installation, an underground obstruction (i.e., existing utility line) the work shall stop and the ENGINEER shall be immediately notified so that the problem can be resolved.

- D. Direct connection to storm sewer main will be permitted if the main is a minimum of 36 inches in diameter (I.D.) and the connecting line is not greater than 12-inches (I.D.). If storm sewer mains are 48 inches (I.D.) or larger, the connecting line diameter may be increased to 18 inches (I.D.). For connecting line sized greater than those specified above, the connecting to the main will be made into a manhole or by inserting into the main a factory constructed wye. Connection to the main will comply with the Standard Detail Drawings.
- E. Removal of curb and gutter, and sidewalk for installation of a storm inlet shall be made at a scored or full depth joint.
- F. Existing pavement removal and replacement shall conform to Part 6 and Section 02571 and shall conform to residential or arterial pavement sections of the same material (asphalt or Portland cement concrete) as the existing pavement.
- G. No width greater than 1/2 inch will be permitted between the inlet grate and the roadside portion of the inlet frame.
- H. Private drainage facility installations, which are to be constructed under the authorization of "Drainage Facilities within Public Right-of-Way," shall comply with the Standard Detail Drawings and appropriate sections of this publication.
- I. The construction inlets shall be done as soon as is practicable after sewer lines into the inlet are complete. All sewers shall be cut neatly at the inside face of the walls of the inlet and pointed up with mortar.
- J. Bases for cast in place inlets may be placed prior to or at the CONTRACTOR'S option after the sewer is constructed.
- K. The inverts passing out or through an inlet shall be shaped and grout across the floor of the inlet as indicated. This shaping may be accomplished by adding shaping mortar or concrete after the base is cast or by placing the required additional material with the base.
- L. All miscellaneous structures shall be completed in accordance with the details indicated. Backfilling to original ground elevation shall be in accordance with the provisions of the appropriate items and as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Trenching, backfilling and compaction will not be measured or paid, but will be considered incidental to other items.

- B. Frame, grates, rings and covers will not be measured or paid, but will be considered incidental to other items.
- C. Connecting pipe shall be measured by the linear foot along centerline of pipe from the main side wall of the inlet to the centerline of the main.
- D. Storm sewer inlets shall be measured per each for the type and size specified.
- E. All miscellaneous structures satisfactorily completed in accordance with the plan and specifications will be measured as complete units per each.

4.02 PAYMENT:

- A. The accepted quantities of connecting pipe shall be paid at the unit bid price per linear foot per type and size of pipe, and shall include pipe in place and all necessary jointing materials.
- B. The accepted quantities of storm inlets will be paid at the unit price per each per type of storm inlet, and shall include: structure, grating, excavation, backfilling and compaction, and curb removal and replacement, as defined in Bid Proposal.
- C. The accepted quantities of special complete structures shall be paid at the unit bid price per each.
- D. Compensation, whether by contract pay item or incidental work will be for furnishing all material, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02590 REINFORCED CONCRETE PIPE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This Item shall govern for furnishing and installing all concrete pipe and materials and for constructing precast concrete pipe culverts or precast concrete sewer mains, laterals, stubs and inlet leads. The pipes shall be of the sizes, strengths and dimensions shown on the plans and shall include all connections to new or existing pipes, sewers, manholes, inlets, headwalls and other appurtenances and jointing materials as may be required to complete the work.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Except as modified herein, precast reinforced concrete pipe shall conform to the design shown on the plans and to ASTM C76 or C655 for circular pipe.
- B. All precast concrete 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.
- C. Unless otherwise shown on the plans, not more than two (2) holes may be placed in the top section of precast pipe for lifting and placing. The holes may be cast, cut, or drilled in the wall of the pipe. The holes shall not exceed three (3) inches in diameter at the inside surface of the pipe wall. Not more than one (1) longitudinal wire or two (2) circumferential wires may be cut per layer of reinforcing steel when locating lift holes in the pipe wall. After the pipe is in place, lift holes shall be filled with concrete or mortar or precast concrete plugs to the satisfaction of the Engineer.

TABLE A
CIRCULAR PIPE
(CLASS, D-LOAD EQUIVALENTS)

C76	C655
CLASS I	800D-LOAD
CLASS II	1000D-LOAD
CLASS III	1350D-LOAD
CLASS IV	2000D-LOAD
CLASS V	3000D-LOAD

2.02 DESIGN:

- A. Reinforced concrete pipe for jacking, boring or tunneling shall meet the requirements of the pertinent ASTM specification with the following additional requirements:
 - 1. The pipe shall have circular reinforcement and for 30 inch and larger diameters shall have an additional layer of Class III reinforcement, 12 inches long, extending into both the tongue and groove of the joint to within 3/4 inch of the end of the tongue and the groove. The minimum wall thickness shall be "B" for the diameter specified, unless special designs are required. The minimum concrete compressive strength for jacking and boring pipe shall be 5000 psi. Variations in the laying length of opposite sides shall not exceed 3/8 inch for pipe diameters 24 inches through 60 inches and 1/2 inch for pipe diameters 66 inches and larger. The maximum joint taper shall be 7 degrees for tongue and groove pipe and 2 degrees for O-ring gasket pipe. Pipe manufactured to these additional requirements shall be marked to identify pipe for jacking and boring.
- B. The Construction Plans will provide a summary indicating the locations and length for all pipes. Additionally, the diameter required D-load and/or class for full circle pipe, will also be shown.

2.03 PHYSICAL TEST REQUIREMENTS:

- A. The acceptability of the pipe shall be determined by the results of the physical tests outlined herein; by appropriate material tests required in ASTM C76, C506, C507, or C655; by absorption tests on selected samples from the wall of the pipe; and by inspection of the finished pipe to determine its conformance with the required design and its freedom from defects. Three-Edge Bearing tests shall be performed on one (1) pipe for each 100' of pipe or fraction thereof of each design or shape, size, class or D-load for the load to produce a 0.01 inch crack and, at the discretion of the Engineer, the pipe may be tested to ultimate load.
- B. As an alternate to the Three-Edge Bearing test, concrete pipe 60 inches in diameter and larger may be accepted on the basis of compressive strength of cores cut from the wall of the pipe. The manufacturer shall furnish facilities and personnel for taking the cores and determining the compressive strength of the samples. Three-Edge Bearing tests and core tests shall be in accordance with ASTM C497.
- C. The manufacturer shall plug and seal coreholes in the pipe wall, after testing, in a manner satisfactory to the Engineer.

2.04 MARKING:

The following information shall be clearly marked on each section of pipe:

- A. The class or D-load of pipe.
- B. The date of manufacture.
- C. The name or trademark of the manufacturer.
- D. One end of each section of pipe with elliptical reinforcement shall be clearly marked during the process of manufacture or immediately thereafter on the inside and the outside of opposite walls to show the location of the "top" or "bottom" of the pipe as it should be installed, unless the external shape of the pipe is such that the correct position of the top and bottom is obvious. Marking shall be indented on the pipe section or painted thereon with waterproof paint.
- E. Pipe for jacking and boring shall be identified for the intended use.

2.05 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.

- A. Causes for Rejection. Pipe shall be subject to rejection for failure to conform to any of the specification requirements. Individual sections of pipe may be rejected because of any of the following:
 - 1. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.
 - 2. Defects that indicate imperfect proportioning, mixing and molding.
 - 3. Surface defects indicating honeycombed or open texture.
 - 4. Damaged ends, where such damage would prevent making a satisfactory joint.
 - 5. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more, regardless of position in the wall of the pipe.
- B. Repairs. Pipe may be repaired if necessary, because of occasional imperfections in manufacture or accidental injury during handling and will be acceptable if, in the opinion of the Engineer, the repairs are sound, properly finished and cured, and the repaired pipe conforms to the requirements of the specifications.

C. Rejections. All rejected pipe will be plainly marked by the Engineer by painting colored spots over the Division of Materials and Tests monogram on the inside wall of the pipe and on the top outside wall of the pipe. The painted spots shall be sufficient to identify the rejected pipe but no larger than four (4) inches in diameter. Rejected pipe shall not be defaced in any other manner. The Contractor shall remove the rejected pipe from the project and replace with pipe meeting the requirements of this Item.

D. Jointing Materials. Unless otherwise specified on the plans the Contractor shall have the option of making the joints using any of the materials described herein. For all jointing materials except mortar, the Contractor shall furnish the Engineer the Manufacturer's Certificate of Compliance.

1. Mortar for joints shall be in accordance with the section, "Jointing", of this Item.
2. Cold Applied, Plastic Asphalt Sewer Joint Compound shall consist of natural and/or processed asphalt base, suitable volatile solvents and inert filler. The consistency is to be such that the ends of the pipe can be coated with a layer of the compound up to one-half inch thick by means of a trowel. The joint compound shall cure to a firm, stiff plastic condition after application. The material shall be of a uniform mixture and any small separation occurring in the container shall be stirred to a uniform mix before use.

This material shall meet the following requirements when tested in accordance with Test Method Tex-526-C:

Asphalt Base, 100% - % Volatiles - % Ash, % by weight	28-45
Volatiles, 212° F Evaporation, 24 h, % by weight	10-26
Mineral Matter, determined as Ash, % by weight	30-55
Consistency, Cone Penetration, 150 q, 5 sec, 77° F	150-275

3. Rubber Gaskets shall conform to ASTM C361 or C443. The design of the joints and permissible variations in dimensions shall be in accordance with ASTM C443. The Contractor shall furnish the Engineer the Manufacturer's Certificate of Analysis.
4. Cold Applied Preformed Plastic Gaskets. Preformed plastic gaskets shall be suitable for sealing joints of tongue and groove concrete pipe. The gasket sealing the joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes or obnoxious odors. The gasket joint sealer shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength, and shall be supplied in extruded

rope-form of suitable cross-section. The size of the plastic gasket joint sealer shall be in accordance with the manufacturer's recommendations and be of sufficient size to properly seal the joint. The plastic gasket joint sealer shall be so constructed as to provide evidence of proper installation either by means of "squeeze-out" of the gasket material on the inside or outside around the pipe joint circumference or by means of tabs, projections or other such indicators placed at established intervals around the circumference of the pipe joint. Plastic gasket joint sealers shall be Type 1 or Type 2. Type 1 gaskets shall meet the "squeeze-out" requirements and Type 2 gaskets shall meet the requirements for tabs, projections or other indicators. The gasket joint sealer shall be protected by a suitable wrapper designed that when removed, the jointing material maintains integrity.

The chemical composition of the gasket joint sealing compound for Type 1 and 2, as shipped, shall meet the following requirements:

COMPOSITION	TEST METHOD	ANALYSIS
Bitumen, Petroleum Plastic		
Content, % by weight	ASTM D4	50-70
Ash-Inert Mineral Matter, % by weight	Tex-526-C	30-50
Volatile Matter, 325 F, % by weight	Tex-506-C	2.0 max.

The gasket joint sealing compound when immersed for 30 days at ambient room temperature separately in five (5) percent solution of caustic potash; a five (5) percent solution of hydrochloric acid; a five (5) percent solution of sulfuric acid; and a saturated H₂S solution, shall show no visible deterioration.

The physical properties of the gasket joint sealing compound as shipped shall meet the following requirements:

PROPERTY	TEST METHOD	REQUIREMENT	
		Type 1	Type 2
Ductility @ 77 F (cm), min.	Tex-503-C	5.0	5.0
Softening Point, F	Tex-505-C	275	275
Penetration			
32 F (300g) 60 sec., min.	Tex-502-C	--	65
77 F (150g) 5 sec.	Tex-502-C	50-120	50-120
115 F (150g) 5 sec., max.	Tex-502-C	--	150

PART 3 – EXECUTION

3.01 CONSTRUCTION METHODS

- A. Excavation. All excavation shall be in accordance with the requirements of Section 02221, "Trench Excavation, Backfill, and Compaction", except where tunneling or jacking methods are shown on the plans or permitted by the Engineer.
- B. Shaping and Bedding. Shaping and bedding shall be in accordance with Section 02221, "Trench Excavation, Backfill, and Compaction".
- C. Laying Pipe. Unless otherwise authorized by the Engineer, the laying of pipe on the bedding shall be started at the outlet end with the spigot or tongue end pointing downstream and shall proceed toward the inlet 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 bedding. These cross trenches shall be not more than two (2) inches larger than the bell ends of the pipe. Proper equipment shall be provided for hoisting and lowering the sections of pipe into the trench without disturbing the bedding 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 the pipe 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 five (5) degrees from the vertical plane through the longitudinal axis of the pipe.

Multiple installations of reinforced concrete pipe shall be laid with the center lines of individual barrels parallel. Unless otherwise shown on the plans, the following clear distances between outer surfaces of adjacent pipes shall be used:

Diameter	18"	24"	30"	36"	42"	48"	54"	60" to 64"
Clear Distance Between Pipes	0'-9" 11"	0'-11" 1"	1'-3" 3"	1'-5" 5"	1'-7" 7"	1'-11" 11"	2'-0"	

- D. Jointing.
 - 1. Joints sealed with portland cement mortar shall be made as follows:
Mortar shall consist of one (1) part cement, two (2) parts sand and sufficient water to make a plastic mix. The pipe ends shall be cleaned and wetted

before making the joint. The lower half of the bell or groove and the upper half of the tongue or spigot shall be plastered with mortar. After the pipes are tightly jointed, mortar shall be packed into the joint from both inside and outside the pipe. The inside shall be finished smooth and flush with adjacent joints of pipe. Over the joint outside the pipe, a bead shall be formed at least one (1) inch on either side of the joint and of semicircular cross section for tongue and groove joints, but for bell and spigot joints, the mortar shall form a 45° fillet between the outer edge of the bell and the spigot. Mortar joints shall be cured by keeping the joints wet for at least 48 hours or until the backfill has been completed, whichever comes first. No jointing shall be done when the atmospheric temperature is at or below 40 F. Mortared joints shall be protected against freezing by backfilling or other approved methods for at least 24 hours.

No mortar banding on the outside of pipe will be required for driveway culverts.

At the Contractor's option, and with the approval of the Engineer, pipes which are large enough for a man to enter may be furnished with the groove not less than one-half of an inch and not more than three-fourths of an inch longer than the tongue. Such pipe may be laid and backfilled without mortar joints. Care shall be exercised to avoid displacing the joints during the backfilling operations. After the backfilling has been completed, the space between the end of the tongue and the groove on the interior of the pipe shall be cleaned of all foreign material, thoroughly wetted and filled with mortar around the entire circumference of the pipe and finished flush.

The Contractor shall make available for the use of the Engineer, an appropriate rolling device similar to an automobile mechanic's "Creeper" for conveyance through small size pipe structures.

Mortar joints will be required for irrigation wells, vents and similar vertical structures.

2. Joints using Cold Applied, Plastic Asphalt Sewer Joint Compound shall be made as follows:

Both ends of the pipes shall be clean and dry. A one-half inch thick layer of the compound shall be troweled or otherwise placed in the groove end of the pipe covering not less than two-thirds of the joint face around the entire circumference. Next, the tongue end of the next pipe shall be shoved home with sufficient pressure to make a tight joint. After the joint is made any excess mastic projecting into the pipe shall be removed. Backfilling of pipe laid with asphalt mastic 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.

3. Joints using Rubber Gaskets shall be made as follows:

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. Backfilling may begin when approved by the Engineer.

4. Joints using Cold Applied Preformed Plastic Gaskets shall be made as

follows:

Before laying the pipe in the trench, the plastic gasket shall be attached around the tongue or groove near the shoulder or hub of each joint in accordance with the gasket manufacturer's recommendations. The protective wrapper shall be removed and the gasket pressed firmly to the clean, dry surface of the pipe, as recommended by the manufacturer. The joint sealer must be placed in such a manner that no dirt or other deleterious materials will come in contact with the joint sealing material.

After the tongue is correctly aligned with the flare of the groove, the wrapper or wrappers on the gasket shall be removed and the pipe shall be pulled or pushed home with sufficient force to properly seal the joint. 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 F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 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 trench, followed by connection to previously laid pipe.

5. Connections and Stub Ends. Connections of concrete pipe to existing pipes, pipe sewers or sewer appurtenances shall be as shown on the plan. The bottom of existing structures shall be mortared or concreted if necessary to eliminate any drainage pockets created by the connections. Any damage to the existing structure resulting from making the connection shall be repaired by the Contractor, to the satisfaction of the Engineer, at the Contractor's expense.

Unless otherwise shown in the plans, connections between concrete pipe and corrugated metal pipe shall be made with a suitable concrete collar having minimum thickness of twelve (12) inches.

Stub ends, for connections to future work not shown on the plans, shall be finished by installing watertight plugs into the free end of the pipe.

6. Backfilling. 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 Item 400, "Excavation and Backfill for Structures". When mortar joints are specified, no fill or backfill shall be placed until the jointing material has been cured for at least six 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 all pipe structures where joints consist of materials other than mortar, immediate backfilling will be permitted.
7. Re-use of Appurtenances. When existing appurtenances are specified on the plans for reuse, the portion to be reused shall be severed from the culvert

and moved to the new position previously prepared by hoisting with a crane, rolling, or other approved methods. Connections shall conform to the requirements for joining sections of pipes, as designated herein or as shown on the plans. Any portion of the headwalls or pipe attached to the appurtenance damaged during the moving operations by the Contractor shall be restored to its original condition at the Contractor's expense. The Contractor may remove and dispose of the existing appurtenances and construct new appurtenances at his expense in accordance with the pertinent specifications and design shown on the plans or as furnished by the Engineer.

8. Protection of Pipe. 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 four (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 the Contractor's expense.

END OF SECTION

SECTION 02601 FLEXIBLE BASE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of furnishing and placing a foundation course for surface courses or for other base courses.
- B. Flexible base shall be composed of either caliche (argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, sand or other granular materials), crushed stone, gravel, iron ore topsoil, shell, or crushed slag.
- C. Flexible base shall be constructed as specified herein in one or more courses in conformance with the details, lines and grades shown on the plans, and as established by the ENGINEER.

PART 2 -PRODUCTS

2.01 MATERIALS:

- A. Materials for flexible base shall be crushed or uncrushed as necessary to comply with the requirements hereinafter specified.
- B. Materials shall consist of durable, coarse aggregate particles mixed with approved binding materials.

2.02 LIME STABILIZATION:

- A. Where shown on the plans, or directed by the ENGINEER, material for flexible base shall be lime stabilized in accordance with the provisions of Section 02240.

2.03 TYPES:

- A. Type A - Crushed or broken aggregate (excluding gravel aggregate).
- B. Type B - Gravel Aggregate
- C. Type F - Caliche

2.04 GRADES:

- A. Unless otherwise shown on the plans or directed by the ENGINEER, the final course of base material shall consist of Grades 1, 2, 3, or 4, as specified in Table 02601-1.
- B. Base courses or subbase materials, unless otherwise noted on the plans or directed by the ENGINEER, may consist of Grades 1, 2, 3, or 4, as specified in Table 02601-1.
- C. All grades shall, when tested in accordance with standard laboratory test procedures, meet the physical requirements set forth in Table 02601-1.
- D. Testing of flexible base materials shall be in accordance with the following test procedures:

<u>TEST</u>	<u>TESTING PROCEDURE</u>
Preparation for soil constants and sieve analysis	TEX-101-E
Liquid Limit	TEX-104-E
Plastic Limit	TEX-105-E
Plasticity Index	TEX-106-E
Sieve Analysis	TEX-110-E
Wet Ball Mill	TEX-116-E
Triaxial Test	TEX-117-E (Part I or II)

- E. Unless otherwise specified on the plans, samples for testing the material for Soil constants, Gradation and Wet Ball Mill shall be taken prior to the compaction operations.
- F. Unless otherwise specified on the plans, samples for triaxial tests shall be taken from the stockpile or from production, as directed by the ENGINEER, where stockpiling is required and from production where stockpiling is not required.

**TABLE 02601-1
PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS**

TYPES	GRAD							
	Grade 1		Grade 2		Grade 3		Grade 4	
	Triaxial Class 1, Min. compressive strength, psi: 45 to 0 psi lateral pressure and 175 at 15 psi lateral		(Triaxial Class 1 to 2.4) Min. compressive strength, psi: 35 to 0 psi lateral pressure and 175 at 15 psi lateral pressure		(Unspecified Triaxial Class)		(Unspecified Triaxial Class)	
TYPE A	Retained on	%	Retained on Sq.	%	Retained on Sq.	%	Retained on Sq.	%
Crushed or Broken Aggregate (excluding gravel aggregate)	1-3/4	0	1-3/4	0-10	1-3/4	0-10	As Shown on Plans	
	7/8"	10-35	No. 4	45-75	No. 40	60-85		
	3/8"	30-50	No. 40	60-85	Max LL	45		
	No. 4	45-65	Max LL	40	Max PI	15		
	No. 40	70-85	Max PI	12	Wet Ball			
	Max LL	35	Wet Ball		Bill Amt	55		
	Max PI	10	Wet Ball Bill Amt	40	Wet Ball Bill Amt	40		
	Wet Ball Bill	40	Max Increase in Passing No. 40	20	Max Increase in Passing No. 40	20		
Max Increase in Passing No.	20							
TYPE B	Retained on	%	Retained on Sq.	%	Retained on Sq.	%	Retained on Sq.	%
Gravel Aggregate	N/A		1-3/4	0-10	2-3/4"	0	As Shown on Plans	
			No. 4	30-75	No. 40	45-65		
			No. 40	70-85	Max LL	35		
			Max LL	35	Max PI	12		
			Max PI	12				
			Max PI	12	Max LL	35		
			No. 4	45-65	No. 40	45-65		
			No. 40	50-70	Max LL	35		
			Max LL	35	Max PI	12		
			Max PI	12				

TYPE F	Retained on Sq.	%	Retained on Sq.	%	Retained on Sq.	%	Retained on Sq.	%
Caliche	N/A		1-3/4	0	1-3/4	0	As Shown on Plans	
			No. 4	45-75	No. 40	50-85		
			No. 40	50-85	Max LL	40		
			Max LL	40	Max PI	12		
			Max PI	12				

G. Materials exhibiting reasonably close conformity with the specified gradation and plasticity index are defined by the following criteria:

1. The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.
2. The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.05 STOCKPILING:

- A. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.
- B. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stockpile for delivery to the road.
- C. In loading from the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.
- D. If the CONTRACTOR elects to produce the Type A material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the coarse aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.
- E. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that

combinations of the materials produced fail to meet all of the specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.

- F. The central mixing plant shall be of either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.
- G. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE:

- A. The roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.
- B. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.
- C. Flexible base shall not be placed until the Contractor has verified by proof rolling that the subgrade has been prepared and compacted in conformity with Standard Specification Item 02220, "Subgrade Preparation," to the typical sections, lines and grades indicated on the Drawings. Any deviation shall be corrected and proof rolled prior to placement of the flexible base material.
- D. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material.
- E. The surface of the subgrade shall be finished to line and grade as established and in conformity with the typical section shown on plans. Any deviation in excess of 1/2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.
- F. Sufficient subgrade shall be prepared in advance to insure satisfactory execution of the work.
- G. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes or otherwise disposed of as directed. Any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the ENGINEER.

3.02 PLACEMENT OF FIRST COURSE - TYPE A, TYPE B, TYPE F MATERIAL:

- A. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section.
- B. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered to each 100-foot station.
- C. Material deposited upon the subgrade shall be spread and shaped the same day.
- D. In the event that inclement weather, or other unforeseen circumstances, renders the spreading of the material during the first 24-hour period impractical, the materials shall be scarified and spread as directed by the ENGINEER.
- E. Throughout the entire operation the material shall be sprinkled, if directed, and shall be maintained by blading and, upon completion, shall be smooth and shall conform to the typical section indicated on the Drawings and to the established lines and grades, shall then be bladed, dragged and shaped to conform to typical sections as shown on plans.
- F. Each lift shall be sprinkled as required to bring the material to optimum moisture content, then compacted to the extent necessary to provide not less than 95 percent nor more than 100 percent of the maximum dry density as determined in accordance with Test Method Tex-114-E. In addition to the requirements specified for density, the full depth of flexible base material shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section of flexible base material is completed, tests, as necessary, will be made by the Engineer or designated representative. As a minimum, three in-place density tests per section per day will be taken. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.
- G. All areas and "nests" of segregated coarse or fine material shall be removed and replaced with well graded material, as directed by the ENGINEER.
- H. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplied in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.
- I. The course shall be compacted by methods of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control"

method of compaction as indicated on the plans, or as directed by the ENGINEER.

1. When the "Ordinary Compaction" method is to be used, the following provisions shall apply:
 - a) The course shall be sprinkled as required and rolled with approved compaction equipment as directed until a uniform compaction is secured. Throughout this entire operation, the shape of the course shall be maintained by blading. Upon completion, the surface shall be smooth and in conformity with the typical sections shown on plans and the established lines and grades.
 - b) In the area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing approved material, as required reshaping and re-compacting by sprinkling and rolling.
 - c) All irregularities, depressions and weak spots which develop in the laid course shall be corrected immediately by scarifying the areas affected, adding approved material as required, reshaping and re-compacting by sprinkling and rolling.
2. When the "Density Control" method of compaction is to be used, the following provisions shall apply:
 - a) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under "Density".
 - b) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.
 - c) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.
 - d) Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to the established lines and grades.
 - e) In the areas on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section and 16 feet in length, measured longitudinally, shall be corrected by loosening, adding or removing approved material as required, reshaping and re-compacting by sprinkling and rolling.
 - f) All irregularities, depressions, and weak spots which develop shall be corrected immediately by scarifying the areas affected, adding approved material as required, reshaping and recompacting by sprinkling and rolling. Should the base course, due to any

reason or cause, lose the required stability, density or finish before the surfacing is complete; it shall be re-compacted and refinished at the sole expense of the CONTRACTOR.

3.03 PLACEMENT OF SUCCEEDING COURSES - ALL MATERIAL TYPES:

- A. Construction methods shall be the same as prescribed for the first course.
- B. Prior to placing the surfacing on the completed base, the base shall be "dry cured" to the extent directed by the ENGINEER.

3.04 REWORKING AN EXISTING BASE COURSE

- A. Existing base courses shall be reworked in accordance with TxDOT Item 251, or as directed by the ENGINEER, and result in a section that conforms the approved lines and grades.

3.05 DENSITY CONTROL:

- A. When the "Density Control" method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.
- B. The testing will be as outlined in Test Method Tex-114-E.
- C. It is the intent of this specification to provide that the part of the base included in the top 8 inches, immediately below the finished surface of the roadway, be not less than 100 percent of the density, as determined by the compaction ratio method.
- D. Field density determination shall be made in accordance with Test Method Tex-115-E.

3.06 TOLERANCES:

- A. Flexible base will be measured by the square yard of surface area of completed and accepted work based on the thickness of flexible base as shown on the plans.
 - 1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Flexible base will be measure by the square yard of surface area of completed and accepted work based on the thickness of flexible base as shown on the plans.
 - 1. The flexible base shall be measured for depth by the units of 2,000 square yards minimum, with one measurement taken at a location selected by the ENGINEER. There shall be a minimum of three (3) locations measured per project.
 - 2. In that unit where flexible base is deficient by more than 1/2 inch in thickness, the deficiency shall be corrected by scarifying, adding material as required, reshaping and re-compacting by sprinkling and rolling.
 - 3. No additional payment over the contract unit price will be made for any flexible base of a thickness exceeding that required by plans.
- B. The CONTRACTOR shall schedule his operations in such a manner as to facilitate the measurement of the pay item.
- C. The ENGINEER may accept the work provided no more than 20% depth tests performed are deficient by not more 1/2 inch and where no two consecutive tests on continuous work are outside the specified depth.

4.02 PAYMENT:

- A. The accepted quantities of flexible base of the type, grade, and compaction method specified will be paid at the contract unit bid price per square yard, complete and in place.
- B. Where "Ordinary Compaction" is used, all sprinkling, rolling, and manipulation required will not be paid for directly, but will be incidental to this bid items.
- C. The unit prices bid shall each be full compensation for shaping and fine grading the roadbed; for securing and furnishing all materials, including all royalty and freight involved; for furnishing scales and labor involved in weighing the material when required; for loosening, blasting, excavating, screening, crushing and temporary stockpiling when required; for loading all materials for all hauling and delivering on the road; for spreading, mixing, blading, dragging, shaping and finishing, and for all manipulation, labor, tools and incidentals necessary to complete the work.

END OF SECTION

SECTION 02610 PRIME COAT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION:

- A. Prime coat shall consist of the application of asphaltic materials on a newly completed base course and/or other approved area, which shall be applied in accordance with these specifications, as shown on the plans, and as directed by the ENGINEER.

1.02 QUALITY ASSURANCE:

- A. Test and Certification of Bituminous Materials.
 - 1. Bituminous materials to be tested in accordance with the requirements of AASHTO M-82 and sampled in conformance with AASHTO T-40.
 - 2. Supply, at the time of delivery of each shipment of asphalt, two certified copies of test reports from the supplying vendor to the ENGINEER.
 - 3. Test reports shall indicate name of vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and result of specified tests.
 - 4. The test report shall be signed by an authorized representative of the vendor and certify that the product delivered conforms to the specifications for type and grade indicated.
 - 5. Certified test reports and the testing required in the preparation of such report shall be at no cost to the City.
 - 6. Final acceptance of bituminous materials shall be dependent on the determination by the ENGINEER that the material meets prescribed standards.

PART 2- PRODUCTS

2.01 MEDIUM CURING CUTBACK ASPHALT:

- A. Medium-curing liquid asphalt, designated by the letters MC, shall consist of an uncracked petroleum base stock, produced by the processing of asphaltic or semi-asphaltic base crude petroleum, blended with a kerosene-type solvent. The base stock for all MC materials shall be straight run asphalt produced within the penetration range of 100 to 300, and the end point of the kerosene type solvent shall not exceed 525°F. Medium curing liquid cutback asphalt shall be free from water and show no separation.
- B. Medium curing cutback asphalt shall consist of materials specified above and shall conform to the requirements set forth in Table 2610-1.

TABLE 2610-1

Specification Designation	AASHTO Test Method	ASTM Test Method	MC 30	MC 70	MC 250	MC 800	MC 3000
Flash Point (Open Cleave) °F, Min.	T 48	D 92	100	100	150	150	150
Viscosity, 140°F, Kinematic, CS	T 201	D 2170	30 - 60	70 - 140	250 - 500	800 - 1600	3000 - 6000
Furol Viscosity at: 77° F (Sec.) 122° F (Sec.) 140° F (Sec.) 180° F (Sec.)	T 72	D 88	75-150	60-120	125-250	100-200	300-600
Distillation Distillate (% of Total Distillate to 680° F) 437° F 500° F 600° F	T 78	D 402	0-25 40-70 75-93	0-20 25-60 75-90	0-10 20-55 70-85	0 10-35 65-80	0 0-15 50-75
Residue from Distillation to 680° F Volume % by Difference Min.			50	55	67	75	80
Tests on Residue from Distillation Penetration at 77° F	T 49	D 5	120 - 250	120 - 250	120 - 250	120 - 250	120 - 250
* Ductility 77° F, cm, Min.	T 51	D 113	100	100	100	100	100
Solubility in CCl ₄ , % Min.	T 44		99.5	99.5	99.5	99.5	99.5

Water, % Max.	T 55	D 95	0.2	0.2	0.2	0.2	0.2
Reaction to Spot Test	T 102**		0	0	0	0	0

- * If penetration of residue is more than 200 and its ductility at 77° F is less than 100, the material will be acceptable if the ductility at 60° F is greater than 100.
- ** Using 85% Standard Naptha and 15% Xylene.

NOTE: Viscosity tests may be made by either Kinematic or Furol test methods.

C. Unless otherwise noted on the plans or directed by the ENGINEER, cutback asphalt Grade MC-30 shall be used.

2.02 BLOTTER MATERIAL:

- A. Supply blotter material consisting of native sand and/or sweepings from base course.
- B. Native sand shall be local material obtained from approved sources as approved by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. Unless otherwise specified on the plans or required by the ENGINEER, only asphaltic material shall be used. Where required, a combination of asphaltic and blotter material shall be used.
- B. Application of Asphaltic Materials Only.
 1. Apply prime coat to prepared surface when ambient air temperature is above 40°F and rising and shall not be applied when the ambient air temperature is below 50°F and falling.
 2. Apply prime coat to surfaces that have been cleaned by sweeping or other approved methods and where base is thoroughly dry and satisfactory for receiving prime coat.
 3. Apply prime coat to cleaned base, at a rate of 0.2 to 0.5 gallons per square yard of surface area, using an approved type of self-propelled pressure distributor so constructed and operated to distribute the material evenly and smoothly.
 4. Provide necessary facilities for the determination of temperature of asphaltic material in all heating equipment and distributors; and for determination of rate at which it is applied; and for securing uniformity at the junction of two distributor loads.

5. Keep in clean and good working condition all storage tanks, piping, reports, booster tanks and distributors used in the storage and handling of asphaltic materials.
6. Operate all associated equipment in a manner such that there is no contamination of asphaltic material with foreign material.
7. Calibrate distributor and furnish ENGINEER with an accurate and satisfactory record of such calibrations.
8. Recalibrate distributor, in a manner satisfactory to the ENGINEER, after the beginning of work, should the yield on the asphaltic material applied appear to be in error.
9. No traffic, hauling or placing of subsequent courses shall be permitted over freshly applied prime coat until authorized by the ENGINEER.
10. Apply asphaltic material at a temperature within 15° F of temperature of application selected by the ENGINEER based on temperature viscosity relationship noted in Table 2610-1.
11. Maintain surface until work is Blotter Material. C. Application of Asphaltic and Blotter Material
 1. Haul blotter material in vehicles of uniform capacity and placed on shoulders at a spacing designated by the ENGINEER.
 2. After application of asphaltic material as specified above, cover surface with blotter material as directed by the ENGINEER.
 3. After application of blotter material, drag surface with approved drag broom, evenly and smoothly distributing the blotter material. Brooming or dragging operation shall continue, as directed by the ENGINEER, until the course has properly cured under traffic.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRIME COAT:

- A. When listed as a separate contract pay item "Prime Coat", asphaltic material for prime coat will be measured for payment at point of delivery on the project in gallons at applied temperature. Payment will be paid at the unit bid price for "Prime Coat".
- B. When not listed as a separate contract pay item, prime coat shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work will be for furnishing all material, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

4.02 BLOTTER MATERIALS:

- A. Blotter material will be considered incidental to asphaltic material for prime coat with no direct payment.

END OF SECTION

SECTION 02612 HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Hot mix asphalt concrete (HMAC) pavement shall consist of a binder course, a leveling up course, a surface course or a combination of the courses as shown on the plans, or as directed by the ENGINEER.
- B. HMAC pavement shall be composed of a compacted mixture of mineral aggregate and asphaltic material, constructed on previously completed and approved subgrade, subbase course, base course, or existing pavement.
- C. HMAC pavement shall be in accordance with the specifications herein and in conformity with the lines, grades, quantities and typical sections in the contract and/or as directed by the ENGINEER.

1.02 QUALITY CONTROL:

- A. HMAC pavement and its constituent part shall conform to the ASTM, AASHTO and/or TxDOT test methods noted below.

PART 2 - PRODUCTS

2.01 ASPHALTIC MATERIALS:

- A. Asphalt cement binders shall be un-cracked petroleum asphalt and shall be carefully refined, by steam, vacuum, or solvent, from asphaltic or semi-asphaltic base crude petroleum at a temperature not to exceed 700° F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subjected to cracking or produced from a crude petroleum source other than that of the original material. The asphalt cement shall not contain residues from non-asphaltic sources. Asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347° F.
- B. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set forth in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that the CONTRACTOR obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, that the CONTRACTOR will remain with that grade throughout the project.

TABLE 2612-1

Specification	AASHTO Test	ASTM Test						
Designation	Method	Method	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Flash Point (Open Cup) Min	T48	D92	--	450	450	450	450	350
Penetration of Orig. Sample at 77° F	T49	D5	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Thin-Film Oven Loss, Hours at 325°F, % Max	T179	D1754	0.75	0.75	0.75	0.75	1.00	1.00
Test of Residue from Thin-Film Oven Test; % of Orig. Pen., Min.	T49	D5	52	50	50	50	50	50
Ductility at 77° F cm. after los at 325° F, Min.	T51	D113	50	50	100	100	100	100
Solubility in CCl ₄ Min.	T44*	None	99.5	99.5	99.5	99.5	99.5	99.5
Reaction to Spot Test	T102**	None	0	0	0	0	0	0

* Procedure No. 1 with CCl₄ substituted for CS₂.

** Using 85% Standard Naphtha Solvent and 15% Xylene.

TABLE 2612-2

TYPE-GRADE	OA-30		OA-175*8		OA-400	
	Min	Max	Min	Max	Min	Max
Penetration at 32° F, 200 g, 60 sec	15	-	--	-	--	-
Penetration at 77° F, 100 g, 5 sec	25	3	150	200	--	-
Penetration at 115° F, 50 g, 5 sec	--	6	--	-	--	-
Ductility at 77° F, 5 cm/min, cms; Original OA	2	-	70	-	--	-
Flash Point COC, °F	450	-	425	-	425	-
Softening Point, R&B, °F	185	-	95	130	--	-
Thin Film Oven Test, 1/8 in. Film 50 g, 5 hrs, 325° F, % Loss by wt.	--	0.	--	1.	--	2
Penetration of Residue, at 77° F, 100 g, 5 sec % of Original Pen	--	-	40	-	--	-
Ductility of Residue at 77°F, 5 cm/min, cms	--	-	--	100	--	-
Solubility in Trichloroethylene, %	99	-	99	-	99	-
Spot Test on Original OA	Neg		Neg		Neg	
Float Test at 122° F, sec	--	-	--	-	120	150
Test on 85 to 115 Pen. Residue* Residue by Wt., %	--	-	--	-	75	-
Ductility, 77° F, 5 cm/min: Original Res, cms	--	-	--	-	100	-
Subjected to Thin Film Test, cms	--	-	--	-	100	-

*Determined by Vacuum Distillation (by evaporation if unable to reduce by vacuum).

** For use with Latex Additive only.

TABLE 2612-3

PROPERTIES	AC-1.5		AC-3		AC-5		AC-10		AC-20		AC-40	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Viscosity, 140° F stokes ...	150	50	300	100	500	100	1000	200	2000	400	4000	800
Viscosity, 275° F stokes ...	0.7	--	1.1	--	1.4	--	1.9	--	2.5	--	3.5	--
Penetration, 77° F 100 g, 5 sec	250	--	210	--	135	--	85	--	55	--	35	--
Flash Point, COC, ° F	425	--	425	--	425	--	450	--	450	--	450	--
Solubility in trichloroethylene, percent ...	99	--	99	--	99	--	99	--	99	--	99	--
Test on residues from thin film oven test: Viscosity, 140° F stokes ...	--	450	--	900	1500	--	3000	--	6000	--	--	12000
Ductility, 77° F, 5 cms per min, cms	100	--	100	--	100	--	70	--	50	--	30	--
Spot Test	Negative for all grades											

C. A minimum of two percent, by weight, latex additive (solids basis) shall be added to the OA-175 Asphalt or to AC-5 Asphalt when specified in the contract. The latex additive shall be governed by the following specifications:

The latex is to be an anionic emulsion of butadiene-styrene low-temperature copolymer in water, stabilized with fatty-acid soap so as to have good storage stability, and possessing the following properties:

Monomer ratio, B/S	70/30
Minimum solids content	67%
Solids content per gal. @ 67%	5.3 lbs.
Coagulum on 80-mesh screen	0.01% max.
Type Anti-oxidant	staining
Mooney viscosity of Polymer (M/L 4@212° F)	100 min.
pH of Latex	9.4 - 10.5
Surface tension	28-42 dynes/cm ²

The finished latex-asphalt blend shall meet the following requirements:

Viscosity at 140° F, stokes	1500 max.
Ductility at 39.2° F, 1 cm. per min., cm.	100 min.

D. Asphalt content shall be within the limits noted below:

Table 2612-4

HMAC Type	Percent of Mixture by Weight	Percent of Mixture by Volume
"A"	3.5 - 7.0	8.0 - 16.0
"B"	3.5 - 7.0	8.0 - 16.0
"C"	3.5 - 7.0	8.0 - 16.0
"D"	4.0 - 8.0	9.0 - 19.0
"F"	3.5 - 6.5	8.0 - 16.0

- E. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicate the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above-specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.
- F. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirements, the material to which such report relates and any work in which it may have been incorporated as an integral component will be only tentatively accepted by the City. Final acceptance will be dependent upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefor. The certified test reports and the testing required in connection with the reports will be at the expense to the City.
- G. Unless otherwise specified in these specifications or in the Supplementary Specifications, the various grades of paving asphalt shall be applied at a temperature range of from 210° F to 325° F, the exact temperature to be determined by the ENGINEER.
- H. Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating. The CONTRACTOR shall furnish and keep on the site, at all times, an accurate thermometer suitable for determining the temperature of the paving asphalt.
- I. HMAC asphalt shall be the grade having the highest penetration, within specified limits, to produce a mix having a maximum stability of the compacted mixtures.
- J. Only one (1) grade of asphalt shall be required unless otherwise shown on the plans or as required by the ENGINEER.

2.02 AGGREGATES:

A. HMAC aggregate will be tested in accordance with the following test standards:

AASHTO T-30	Mechanic Testing
AASHTO T-27	Passing No. 200 Sieve
AASHTO T-89	Liquid Limit
AASHTO T-96	Los Angeles Abrasion
AASHTO T-104	Soundness (Magnesium Sulfate)
ASTM C – 131	Resistance to Degradation
ASTM C – 136	Sieve Analysis
ASTM C – 2419	Sand Equivalence Value
TxDOT Tex -106-E	Method of Calculating Plasticity Index of Solids
TxDOT Tex-217 – F	(I & II) Determination of Deleterious Materials and Decantation Test
TxDOT Tex-203 – F	Quality Tests for Mineral Aggregates

B. Aggregates shall have an abrasion of not more than 40 for all courses except the non-skid surface course, which shall have an abrasion of not more than 35.

C. When properly proportioned, HMAC aggregate shall produce a gradation which will conform to the limitations for classification for HMAC type shown below, or as directed by the ENGINEER.

D. Course aggregate to be crushed limestone rock or crushed gravel with hydrated lime or limestone filler. (Crushed gravel shall be per TxDOT Specifications.)

E. Binder aggregate to be composed of 15% crushed limestone screening or as directed by the engineer.

1. Type "A" - Course Graded Base Course

	Percent Aggregate by Weight or Volume
Passing 2" sieve	100
Passing 1-3/4" sieve.....	95 to 100
Passing 1-3/4" sieve, retained on 7/8" sieve.....	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve.....	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve.....	10 to 26
Passing No. 4 sieve, retained on No. 10 sieve .	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No. 10 sieve, retained on No. 40 sieve	5 to 21
Passing No. 40 sieve, retained on No. 80 sieve	3 to 16
Passing No. 80 sieve, retained on No. 200 sieve	2 to 16
Passing No. 200 sieve	1 to 8

2. Type "B" - Fine Graded or Leveling-Up Course

	Percent Aggregate by Weight or Volume
Passing 1" sieve.....	100
Passing 7/8" sieve.....	95 to 100
Passing 7/8" sieve, retained on 3/8" sieve	21 to 53
Passing 3/8" sieve, retained on No. 4 sieve.....	11 to 42
Passing No. 4 sieve, retained on No. 10 sieve.....	5 to 26
Total retained on No. 10 sieve.....	58 to 74
Passing No. 10 sieve, retained on No. 40 sieve.....	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve.....	4 to 21
Passing No. 80 sieve, retained on No. 200 sieve.....	3 to 21
Passing No. 200 sieve.....	1 to 8

3. Type "C" - Course Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 7/8" sieve.....	100
Passing 5/8" sieve.....	95 to 100
Passing 5/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve.....	11 to 37
Passing No. 4 sieve, retained on No. 10 sieve.....	11 to 32
Total retained on No. 10 sieve.....	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve.....	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve.....	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve.....	3 to 27
Passing No. 200 sieve.....	1 to 8

4. Type "D" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 1/2" sieve.....	100
Passing 3/8" sieve.....	85 to 100
Passing 3/8" sieve, retained on No. 4 sieve.....	21 to 53
Passing No. 4 sieve, retained on No. 10 sieve.....	11 to 32
Total retained on No. 10 sieve.....	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve.....	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve.....	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve.....	3 to 27
Passing No. 200 sieve.....	1 to 8

5. Type "F" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 3/8" sieve.....	100
Passing No. 4 sieve.....	95 to 100
Passing No. 4 sieve, retained on No. 10 sieve.....	58 to 73
Passing No. 10 sieve, retained on No. 40 sieve.....	6 to 26
Passing No. 40 sieve, retained on No. 80 sieve.....	3 to 13
Passing No. 80 sieve, retained on No. 200 sieve.....	2 to 11
Passing No. 200 sieve.....	1 to 8

2.03 PRIME COAT:

- A. Prime coat, when specified on the plans, or directed by the ENGINEER, shall be in accordance with Section 02610 - Prime Coat, and as specified herein.
- B. Prime coat shall be applied to the surfaces of bases at least 12 hours prior to placing the HMAC unless otherwise directed by the ENGINEER.
- C. Asphalt prime shall be applied uniformly at the rate in accordance with Section 02610 - Prime Coat.
- D. In order to prevent lapping at the junction of two applications, the distributor shall be promptly shut off. A hand spray shall be used to touch up all spots unavoidably missed by the distributor.
- E. Immediately prior to application of the asphalt prime, an inspection will be made by the ENGINEER to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with cover aggregate.
- F. The surface to be primed shall be in a smooth and well-compacted condition, true to grade and cross section, and free from ruts and inequalities.
- G. The pressure distributor used for applying prime coat material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to enable him to maintain the constant speed required for application at the specified rate.
- H. The pressure distributor shall be equipped with a tachometer registering the pump speed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by the ENGINEER by more

than 10%. Suitable means for accuracy indicating at all times the temperature of the prime material shall be provided. The thermometer well shall be so placed as not to be in contact with a heating tube.

- I. The distributor shall be so designed that the normal width of application shall be not less than 6 feet, with provisions for the application of lesser width when necessary. If provided with heating attachments, the distributor shall be so equipped and operated that the prime material shall be circulated or agitated through the entire heating process.
- J. The asphalt prime coat should preferably be entirely absorbed by the base course and, therefore, require no sand cover. If, however, it has not been completely absorbed prior to the start of placing the asphalt concrete mixture and in the meantime it is necessary to permit traffic thereon, sufficient sand shall be spread over the surface to blot up the excess liquid asphalt and prevent it from being picked it up by traffic. Also, sand shall be used in areas where traffic may pass over the prime coat. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base. If a sand cover is specified in the Supplementary Specifications or noted on the plans to cover asphalt prime, it shall be applied within 4 hours after the application of said prime coat, unless otherwise ordered by the ENGINEER.
- K. Liquid asphalt shall be prevented from being sprayed upon adjacent pavements, structures, guard rails, guide posts, culvert markers, trees, and shrubbery that are not to be removed; adjacent property and improvements; other facilities or that portion of the traveled way being used by traffic.
- L. The CONTRACTOR shall protect the prime coat against all damage and markings, both from foot and vehicle traffic. Barricades shall be placed where necessary to protect the prime coat. If, after the prime coat has been applied to the satisfaction of the ENGINEER and has been accepted, if it is disturbed by negligence on the part of the CONTRACTOR, it shall be restored at his expense to its condition at the time of acceptance. No material shall be placed until the prime coat is in a condition satisfactory to the ENGINEER.

2.04 TACK COAT:

- A. If the asphalt concrete pavement is being constructed directly upon an existing hard-surfaced pavement, a tack coat shall be evenly and uniformly applied to the existing pavement prior to the placing of the new asphalt concrete. The surface shall be free of water, all-foreign material, or dust when the tack coat is applied. No area shall be treated in any one day greater than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.

- B. Tack coat for HMAC shall consist of either rapid curing cut-back asphalt RC-2 diluted by addition of (not to exceed 15 percent by volume) an approved grade of gasoline and/or kerosene; emulsified asphalt, EA-11M diluted with 50 percent water, or a cut-back asphalt made by combining 50 to 70 percent of the asphaltic materials specified for the paving mixture with 30 to 50 percent gasoline and/or kerosene by volume.
- C. Tack coat shall conform to the requirements of Section 02620 - Tack Coat, or as specified herein.
- D. Application of tack coat shall be 0.10 to 0.15 gallons per square yard, or as directed by the ENGINEER.
- E. A similar tack coat shall be applied to the surface of any course if, in the opinion of the ENGINEER, the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.
- F. When required, the contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the adjoining asphalt concrete is placed. Asphalt tack coat shall be applied in controlled amounts as shown on the plans or determined by the ENGINEER. Surfaces where a tack coat is required shall be cleaned to the satisfaction of the ENGINEER before the tack coat is applied.

2.05 MINERAL FILLER:

- A. Mineral filler, other than hydrated lime, shall consist of a thoroughly dry stone dust, portland cement or other mineral dust approved by the ENGINEER.
- B. The mineral filler shall be free from foreign or other deleterious matter.
- C. When tested by the method outlined in TxDOT Test Method Tex-200-F (Part 1 or 3), mineral filler shall meet the following gradations by weight:

Passing No. 30 Sieve	95-100%
Passing No. 80 Sieve	75%
Passing No. 200 Sieve	55%

2.06 ANTI-STRIPPING COMPOUND

- A. Anti-Stripping compound, as required in the job mix formula, shall be furnished in the amounts calculated therein.

2.07 JOB MIX FORMULA:

- A. A job mix formula based on representative samples, including filler if required, shall be determined submitted by the CONTRACTOR for approval of the ENGINEER.
- B. The resultant job mix formula shall be within the master range for the specified type of HMAC.
- C. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size and a single percentage of bituminous material to be added to the aggregate and shall provide for 3 to 5% air voids in the resultant design mix. During the mix design process the following factors will be considered: air voids, Marshall Stability, durability, water resistance, and asphalt film thickness.
- D. After the job mix formula is established, mixtures for the project shall conform to the following tolerances which may fall outside of the specified master range:

	Percent by Weight or Volume as Applicable
Passing 1-3/4" sieve, retained on 7/8" sieve	± 5
Passing 7/8" sieve, retained on 5/8" sieve	± 5
Passing 5/8" sieve, retained on 3/8" sieve	± 5
Passing 3/8" sieve, retained on No.4 sieve	± 5
Passing No.4 sieve, retained on No.10 sieve	± 5
Total retained on No.10 sieve	± 5
Passing No.10 sieve, retained on No.40 sieve	± 3
Passing No.40 sieve, retained on No.80 sieve	± 3
Passing No.80 sieve, retained on No.200 sieve	± 3
Passing No.200 sieve	± 3
Asphaltic Material	± 0.05 by wt or 1.2 by vol.
Mixing Temperature	± 20° F

- E. Asphaltic mixture shall be tested in accordance with TxDOT Test Method Tex-200-4 (Part I or Part III) and shall have the following laboratory values:

		Surface Course	Base Course
Density:	Minimum	95%	95%
	Maximum	98%	99%
	Optimum	96.5%	96.5%
Stability (Hveem)	Minimum	30%	30%
	Maximum	45%	45%

Stability (Marshall – 75 Blow Briquette)	1500 lbs	1500 lbs.
Voids	3 - 7%	4 - 7%
Voids Filled With Asphalt	75 - 85%	65 -80%
Sand Equivalent	40	40

2.08 EQUIPMENT:

- A. All equipment for the handling of all material, mixing, and placing of HMAC shall be in accordance with the provisions of TxDOT Item 340.

2.09 STOCKPILING, STORAGE, PROPORTIONING AND MIXING:

- A. Stockpiling, storage proportioning and mixing operations shall be in accordance with the Provisions of TxDOT Item 340.

PART 3 - EXECUTION

3.01 WEATHER AND TEMPERATURE LIMITATIONS:

- A. Asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall not be placed when the air temperature is 50° F and falling, but may be placed when the air temperature is 40° F and rising.
- B. Asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is less than or equal to 60° F and falling, but may be placed when the air temperature is greater than or equal to 50° F and rising.
- C. Mat thicknesses of 1 inch or less shall not be placed when the temperature on which the mat is to be laid is below 50° F.
- D. No tack coat or asphaltic mixture shall be placed when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the ENGINEER, are unsuitable.
- E. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50° F or more below the temperature established by the ENGINEER, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.02 EQUIPMENT:

A. Hauling Equipment:

1. Trucks used for hauling asphaltic mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a minimal amount of paraffin oil, lime slurry, tine solution or other approved material to prevent mixture adhesion to the bed.
2. The dispatching of hauling equipment shall be arranged so that all material delivered may be placed and all rolling completed during daylight hours, unless otherwise directed by the ENGINEER.
3. All trucks shall be equipped with a cover of canvas, or other suitable material to protect the mixture from weather or on hauls where the temperature of the mixture will fall below specified level. Use of covers will be as directed by the ENGINEER.

B. Rollers:

1. Pneumatic Tire Roller. This roller shall consist of not less than seven pneumatic tire wheels, running on axles in such manner that the rear group of tires shall cover the entire gap between adjacent tires of the forward group; mounted in a rigid frame; and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The tire shall provide surface contact pressures up to 90 pounds per square inch or more. The roller shall be so constructed as to operate in both a forward and a reverse direction with suitable provisions for moistening the surface of the tires while operating; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.
2. Two Axle Tandem Roller. This roller shall be an acceptable power-driven, steel-wheel, tandem roller weighing not less than eight tons. It must operate in forward and reverse directions; contain provision for moistening the surface of the wheels while in motion; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.
3. Three Wheel Roller. This roller shall be an acceptable power-driven, all steel, and three wheel roller weighing not less than 10 tons. It must operate in forward and reverse directions; contain provisions for moistening the surface of the wheel while in motion; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.
4. Vibratory Steel Wheel Roller. If approved for use by the OWNER, this roller shall have a minimum weight of six tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used. It shall be operated in accordance with the manufacturer's recommendations.

C. Straight Edges:

1. The CONTRACTOR shall provide an acceptable 16-foot straight-edge for surface testing. Satisfactory templates shall be provided as required by the ENGINEER.

D. Spreading and Finishing Machine:

1. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans.
2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. Design will be such that no part of the truck weight will be supported by the paver.
3. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The screed shall be adjustable for both height and crown and shall be equipped with a controlled heating device.
4. The bituminous paver shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except that these requirements will not apply when asphalt concrete is placed adjacent to portland cement concrete pavement. Subsequent passes may utilize the matching device of one foot minimum length riding on the adjacent lay.

3.03 CONSTRUCTION METHODS:

A. Spreading and Finishing:

1. The asphalt concrete mixture shall be laid on the approved surface, spread and struck off to the grade and elevation established. It shall be spread and compacted in layers as shown on the plans or as directed by the ENGINEER. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.
2. The ENGINEER will determine a minimum placement temperature within a range from 220° F to 300° F which will produce the required density. The established placement temperature, which is measured immediately behind the laydown machine, shall not vary more than 20° F.

3. A conventional paver or suitable equipment approved by the ENGINEER may be used to place asphalt concrete material on shoulders depressed from the traveled lanes in order to establish a uniform typical section. Approval of the equipment used will be based upon the results obtained.
4. The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded into the paving machine; however, no asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than 250 feet in front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped shall be picked up and loaded into the paving machine.
5. To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to insure continuous operation.
6. The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end independently, including any screed attachment used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.
7. When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of alignment.
8. All courses of asphaltic concrete shall be placed and finished by means of self-propelled paving machines except under certain conditions or at certain locations where the ENGINEER deems the use of self-propelled, paving machines impracticable.
9. Self-propelled paving machines shall spread the asphaltic concrete without segregation or tearing within the specified tolerances, true to the line, grade, and crown indicated on the plans. Pavers shall be equipped with hoppers and augers which will place the asphaltic concrete evenly in front of adjustable screeds without segregation. Screeds shall include any strike-off device operated by tamping or vibrating action which is effective without tearing, shoving or gouging the asphaltic concrete and which produces a finished surface of an even and uniform texture for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.
10. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, fluted and compacted with hand tools. For such areas the mixture shall be dumped, spread and screed to give the required compacted thickness.

B. Compaction:

1. Rolling with the 3-wheel and tandem roller shall start longitudinally at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels.
2. Alternate trips of the roller shall be slightly different in length.
3. Rolling with a pneumatic tired roller shall be as directed by the ENGINEER.
4. Rolling shall continue with no further compression can be obtained and all roller marks are eliminated.
5. The motion of the roller shall be slow enough at all times to avoid displacement of asphaltic materials. If displacement occurs, it shall be corrected immediately by use of rakes and fresh asphaltic mixtures, where required.
6. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool.
7. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water; however, excess water shall not be allowed.
8. All precautions shall be taken to prevent dripping of gasoline, oil, grease, or other foreign substances on the surface or base courses during rolling operations or while rollers are standing.
9. With the approval of the ENGINEER, a vibratory steel wheeled roller may be substituted for the 3-wheel roller and tandem roller.
10. Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.
11. Any mixture that becomes loose, broken, mixed with dirt, segregated, or is in any way defective shall be removed and replaced with fresh hot bituminous mixture, which shall be compacted to conform with the surrounding area. Any area showing excess or deficiency of bituminous material shall be corrected immediately as directed by the ENGINEER.

C. In-Place Density:

1. In-place density shall be required for all mixtures except thin irregular depth leveling courses.
2. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory test method outlined in TxDOT Bulletin C-14.
3. Density shall be determined with a portable nuclear test device in conformity with ASTM D-2950.76.
4. Calibration of the portable nuclear device will be established by the ENGINEER from cut pavement samples tested in accordance with AASHTO T-166 (weight, volume method). The density readings of the cut pavement samples determined in accordance with AASHTO T-166 (weight, volume method), and the density readings of the pavement samples

determined by the portable nuclear test device in conformity with ASTM D 2950 will be correlated by the ENGINEER.

5. Other methods of determining in-place density may be used as deemed necessary by the ENGINEER.
6. It is intended that acceptance density testing will be done while the bituminous mixture is hot enough to permit further compaction if necessary. If the density of an acceptance section does not meet the specified requirements, the CONTRACTOR shall continue the compaction effort until the optimum density is obtained. Rolling for any compactive effort will not be allowed when the temperature of the mix is below 175° F unless authorized in writing by the ENGINEER. Rerolling the paved surface after it has initially cooled will not be allowed.
7. If in-place density tests of the mixture produce a value lower than specified and in the opinion of the ENGINEER is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction procedures until in-place density equals or exceeds the specified density.
8. In-place density tests will be provided by the ENGINEER unless otherwise specified.

D. Joints:

1. Placing of the asphalt concrete shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the ENGINEER.
2. When plant mix bituminous pavement is placed over plant mix bituminous treated base or when plant mixed seal coat is placed over plant mix bituminous pavement, longitudinal joints shall be staggered at least 6 inches with relation to the longitudinal joints of the underlying course.
3. Transverse joints shall have a two foot or 12:1 minimum taper. Longitudinal joints shall have a one foot or 6:1 minimum taper. All transverse tapers shall be cut and squared off prior to commencing new work. Tapered longitudinal joints from previous operations shall be cleaned and tack coated if directed by the ENGINEER. All joints shall be completely bonded. The surface of each course at all joints shall be smooth and shall not show any deviations in excess of 3/16 of an inch when tested with a 10-foot straightedge in any direction.
4. When paving under traffic, the CONTRACTOR shall plan his daily surfacing operations on a schedule which will result in not more than one (1) day's operation of exposed longitudinal joints. The longitudinal joints shall not have a height greater than two (2) inches and shall not be left exposed longer than 24 hours.

E. Surface Tolerance:

1. Upon completion, the pavement shall be true to grade and cross section.

Except at intersections or any changes of grade, when a 16 foot straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straight edge more than 1/16-inch per foot. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain any water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the ENGINEER at the expense of the CONTRACTOR.

F. Manholes and Valve Covers:

1. Manhole frames and valve covers shall be adjusted prior to placing the surface course.

G. Compacted Thickness of HMAC Surface and Base Courses:

1. Surface Courses. The compacted thickness or depth of the asphaltic concrete surface course shall be as shown on the plans. Where the plans require a depth or thickness of the surface course greater than two inches compacted depth, same shall be placed in multiple courses of equal depth, each of which shall not exceed two inches compacted depth. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple courses, it shall be applied at the rate as directed.
2. Base Courses. The compacted thickness or depth of each base course shall be as shown on the plans. Where the plans require a depth or thickness of the course greater than 4 inches, same shall be accomplished by constructing multiple lifts of approximately equal depth, each of which shall not exceed these maximum compacted depths. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as hereinbefore specified and at the rate as directed.

H. Pavement Thickness Tests:

1. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the ENGINEER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the ENGINEER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR'S expense.

I. Price Adjustment for Roadway Density

1. The payment of the unit price will be adjusted for roadway density as outlined in the following table. The adjustment will be applied on a lot by lot basis for each lift. The adjustment will be based on the average of five density tests. The price adjustment will be applied to the entire asphalt concrete mix which includes the HMAC aggregate, the asphalt cement and anti-stripping compound, if used.

Average Density % of Lab Density	Percent of Contract Price To Be Paid
Above 95%	100%
94.0 to 94.99	96%
93.0 to 93.99	91%
92.0 to 92.99	85%
Less than 92.00	*

* This lot shall be removed and replaced to meet specification requirements as ordered by the ENGINEER. In lieu thereof, the CONTRACTOR and the ENGINEER may agree in writing that for practical purposes, the lot shall not be removed and will be paid for at 50% of the contract price.

PART 4 - MEASUREMENT AND PAYMENT

4.01 INCIDENTAL WORK:

- A. Prime coat, anti-stripping compound, where used, and tack coat shall not be measured for direct payment, but shall be considered as subsidiary work pertaining to the placing of asphaltic mixtures of the contract price.

4.02 MEASUREMENT:

- A. Hot-mix asphalt concrete material shall be measured by the ton of 2,000 pounds or by the square yard of the type or types used in the completed and accepted work, as shown on the Bid Proposal.
- B. Weight shall be determined by a certified scale approved by the OWNER and recorded serially numbered weight tickets, identifying the vehicle and presented to the ENGINEER'S representative on the job.

4.03 PAYMENT:

- A. Work performed and materials furnished, as prescribed by this item, measured as provided herein, shall be paid at the unit bid price per ton or square yard for the type or types of hot mix asphalt concrete pavement shown on the proposal.

- B. Unit bid price shall be payment in full for quarrying; furnishing all materials; for all heating; mixing; hauling; cleaning existing base course or pavement; placing asphaltic mixtures; rolling and finishing; and for all labor, tools, equipment and incidentals necessary to complete the work, including the work and materials involved in the application of prime coat and tack coat.

END OF SECTION

SECTION 02620 CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of the construction of concrete curb, concrete curb and gutter, concrete gutter or valley gutter, or combination thereof in compliance with the specifications, lines, grades, and details shown on the plans, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete and manufactured curb and gutter materials shall be subject to inspection and tests at plants and construction sites for compliance with quality requirements.
- B. Concrete curb and gutter or concrete valley gutter shall be constructed with concrete conforming to the provisions of Section 02630 - Concrete Pavement, or Class "B" concrete conforming to the requirements of Section 03300 - Cast- In-Place Concrete.
- C. Pre-formed expansion Joint Filler shall conform to the requirements of AASHTO M-33 or M-153.
- D. Linseed Oil shall conform to the requirements of AASHTO D-260.
- E. Mineral Spirits shall conform to the requirements of AASHTO D-235.

2.02 FOUNDATION:

- A. Concrete curb and gutter or concrete valley gutter shall be placed on an approved foundation conforming to the requirements of the following City of Edinburg Specifications:
 - 1. Section 02220 - Subgrade Preparation
 - 2. Section 02226 - Excavation, Backfill & Compaction for Pavement
 - 3. Section 02601 - Flexible Base

PART 3 - EXECUTION

3.01 EXCAVATION:

- A. When required, excavation shall be made to the specified depth, and the base upon which the curb and gutter or valley gutter is to be placed shall be compacted to a firm, even surface conforming to the requirements of Subsection 2.02 above.
- B. All soft and unacceptable material shall be removed and replaced with material approved by the ENGINEER in conformance with the requirements of Subsection 2.02 above.

3.02 FORMS:

- A. Forms shall be of wood or metal, straight, free from warp, and of such construction that facilitates the inspection of the grade and alignment for compliance with the approved plans and specifications.
- B. All forms shall extend for the entire depth of the curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placement of the concrete. Flexible forms shall be used in curved sections so that the top surface of the forms will form a smooth, continuous arc.

3.03 MIXING AND PLACING:

- A. Concrete shall be proportioned, mixed, and placed in accordance with the requirements of Section 02630 – Concrete Pavement and Section 03300 – Cast in Place Concrete.
- B. Compaction of the concrete placed in forms shall be by vibration or other acceptable methods.
- C. Unless otherwise provided. After initial set, the exposed surfaces of curbs and gutters shall be finished by belting, or with steel or wooden floats then broom finish to achieve a uniform texture to the satisfaction of the Engineer. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the curb and gutter.

3.04 SECTIONS:

- A. Curb and gutter shall be constructed in sections having a uniform length of 20 feet, unless otherwise directed by the ENGINEER. Except at expansion joints, sections shall be separated by open joints 1/8 inch wide x 1/2" deep.

3.05 EXPANSION JOINTS:

- A. Expansion joints shall be formed at the intervals shown on the plans using preformed expansion joints filler having a thickness of 3/4 inch. If not shown

on the plans, expansion joints shall be placed at no greater than 100 foot intervals.

- B. When the curb and gutter or concrete valley gutter is constructed adjacent to an existing concrete pavement, an expansion joint shall be located between the curb and gutter section and the existing concrete pavement.

3.06 CURING

- A. Immediately upon completion of the finishing, the curb and gutter shall be moistened and kept moist for 3 days, or the curb and gutter shall be cured by the use of a membrane-forming material. The method and details of curing shall be subject to the approval of the ENGINEER.

3.07 SURFACE TREATMENT:

- A. The surface of concrete curb and gutter or concrete valley gutter shall be treated with a solution of Linseed Oil and Mineral Spirits in accordance with the applicable requirements of Section 03300 - Cast-In-Place Concrete.

3.08 BACKFILLING:

- A. After the concrete has set sufficiently, the spaces in front and behind the curb and gutter section shall be refilled to the required elevation with material approved by the ENGINEER, and shall be thoroughly tamped in layers of not more than 6 inches.

3.09 SLIP-FORM CONCRETE CURB, CONCRETE CURB AND GUTTER OR CONCRETE VALLEY GUTTER:

- A. Any concrete curb or concrete curb and gutter, except on structures, may be placed using a slip form machine provided that the finished concrete curb or concrete curb and gutter is true to line and grade, the concrete is dense, and of the required surface texture.
- B. The concrete shall be of a consistency that it will maintain the shape of the concrete curb or concrete curb and gutter section without support after slip forming.
- C. The top and face of the finished concrete curb or concrete curb and gutter shall be true and straight and the top surface of the concrete curb or concrete curb and gutter shall be of uniform width and free from humps, sags, or other irregularities.
- D. The forming portion of the slip form machine shall be readily adjustable vertically during the forward motion of the slip form machine to provide a variable

height of concrete curb or concrete curb and gutter grade when necessary. A grade line gauge or pointer shall be attached to the slip form machine in such a manner that a continual comparison can be made between the concrete curb or concrete curb and gutter grade as indicated by the offset guidelines.

- E. Concrete shall be fed to the slip form machine at a uniform rate. The slip form machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a wet brush. Finishing with a brush application of grout will not be permitted.
- F. Transverse weakened planes and expansion joints shall be constructed at right angles to the line of the concrete curb, concrete curb and gutter, or concrete valley gutter.
- G. Expansion joints may be constructed by sawing through the concrete curb or concrete curb and gutter section to its full depth. The width of the cut shall be such as to admit the joint filler with a snug fit.
- H. The operations of sawing and inserting the joint filler shall be completed before curing the concrete. At the conclusion of the curing period the filler in each joint shall be checked for tightness of fit. Loose filler in any joint shall be mortared in place and cured.
- I. Excavation shall be as per Subsection 3.02 above.
- J. All remaining provisions of Subsection 2.02 above also apply, unless otherwise specified.

3.10 FIELD TEST SPECIMENS:

- A. Concrete samples shall be furnished by the Contractor and shall be taken in the field to determine the consistency, air content, and strength of the concrete. Compressive test cylinders shall be made as the concrete is placed. Test ages will be 7 days and 28 days. Test cylinders for compressive strength tests shall be taken and cured in accordance with ASTM C-31 and tested in accordance with ASTM C-39. At least five cylinders (a set) shall be made for each 50 cubic yards or fraction thereof placed (a lot) and 2 samples shall be tested at 7 days, two samples shall be tested at 28 days and one sample shall be retained for possible sampling, if necessary, at 56 days. No extra compensation will be allowed for materials and work involved in fulfilling these requirements.
- B. The concrete shall be sampled in accordance with ASTM C172. The lot will be accepted without adjustment in payment if the average the two 28 day compressive strength tests, indicates a strength of 98% of design or greater.

- C. If the average of the two 28-day samples is below 98% of the design strength, then the fifth sample shall be broken at 56 days. A “revised” average value shall then be determined based on the average of the sum of the two 28-day tests plus the 56-day test. The revised average shall be the basis for final payment based on the following table:

PAY FACTOR SCHEDULE FOR NON-COMPLIANT COMPRESSIVE STRENGTH TESTS

Strength (Based on an “Revised” Average of 4 Cylinders) % of Design	Pay Factor (Percent of Contract Unit Price)
100 - 98	100
98 - 96	85
96 - 94	75
94 - 92	70
92 - 90	60
90 - 88	55
88 - 86	50
> 86	Reject

- D. If the material is below 86% of design strength, the contractor shall, upon written notification from the City, immediately remove and replace all concrete within the identified lot at no additional costs to the City. Any and all work associated with the removal and reconstruction of any failed concrete work shall be borne by the contractor.
- E. If the material is below 86%, then the contractor shall be responsible for payment of any and all subsequent costs for the testing of the replacement materials.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Curb and gutter, curb, and valley gutter shall be measured by the linear foot.
1. Curb shall be measured along the front face of the section at the finished grade elevation.
 2. Combination curb and gutter will be measured along the face of the curb at the flow line of the gutter.
 3. Valley gutter will be measured along the flow line of the gutter.

- B. A deduction in length **shall be** made for drainage structures, such as catch basins or inlets, in the curb, gutter, or combination thereof.
- C. There will be no direct measurement or payment of materials used to construct curb and gutter, curb, or valley gutter.
- D. Excavation or construction of embankment for foundation of curb, valley gutter, or combination curb and gutter will not be measured for payment.

4.02 PAYMENT:

- A. The accepted quantities of curb, valley gutter, and curb and gutter will be paid for at the contract unit bid price per linear foot for each kind and type specified, complete and in place.
- B. Foundation preparation by excavating or constructing embankment to the required subgrade elevation is considered incidental to the completion of the work and no direct payment will be made thereof.
- C. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 02630 CONCRETE PAVEMENT

PART 1 - GENERAL

- 1.0** THE GENERAL CONDITIONS, SPECIAL PROVISIONS and applicable requirements of DIVISION 1 - GENERAL REQUIREMENTS are hereby made a part of this section.
- 1.1** **SCOPE:** This work consists of street pavement, sidewalk, curb and gutter or rip rap slope pavement composed of Portland Cement Concrete with or without reinforcement, constructed on subgrade or base courses prepared in accordance with these specifications and to the lines, grades, thicknesses and typical cross-sections shown on the plans. Reinforcement, when required, will be subsidiary to the specified Concrete Pavement.

PART 2 - PRODUCTS

- 2.0** **PORTLAND CEMENT**
Portland cement concrete shall conform to the requirements of "Section 03301 - Concrete" for each type and strength indicated in the plans.
- 2.1** **JOINT FILLER AND SEALER:**
Joint sealants and expansion joint filler materials shall conform to "Item #433, JOINT SEALANTS & FILLERS" in the 1993 edition of TxDOT Standard Specifications for Construction of Highways, Streets and Bridges.
- 2.2** **STEEL REINFORCEMENT:**
Reinforcing bars shall conform to the requirements of AASHTO M31 or M53, Grade 60. Fabricated bar mats may be used if they conform to the requirements of AASHTO M54.
- 2.3** **DOWELS AND TIE BARS:**
Dowels and tie bars shall conform to the requirements of AASHTO M31 or M53, Grade 60 or Grade 40, as specified on the plans. Tie bars shall be deformed meeting the requirements of AASHTO M31 or M53. Dowel and tie bars may conform to the requirements of AASHTO M 42, except that rail steel shall not be used for tie bars that are to be bent or re-straightened during construction. Dowel bars shall be plain round bars of the size specified and the ends shall be sawed. Before delivery to the construction site, a minimum of two-thirds of the length of each dowel bar shall be painted with one coat of lead or tar paint. Prior to placement of concrete, the dowels shall be coated with grease if specified on the plans.
- 2.4** **WATER:**
Water used in mixing or curing shall be as clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product as

possible. Water will be tested in accordance with the requirements of AASHTO Method T26. Water known to be of potable quality may be used without testing.

2.5 COVER MATERIALS FOR CURING:

Curing materials shall conform to one of the following specifications:

1. "Sheet Materials for Curing Concrete" shall conform to AASHTO M171.
2. "Burlap Cloth Made from Jute or Kenaf" shall conform to AASHTO M182, Class
3. "Liquid Membrane - Forming Compounds for Curing Concrete" shall conform to AASHTO M148, Type 2 (all-resin base), or Federal Specification TT-C-800, Type 2. Liquid Membrane shall be delivered and stored in bulk. Bulk storage shall be equipped with an agitator. All membranes shall be pigmented to allow visible inspection of coverage.

2.6 POZZOLANIC ADMIXTURE:

The use of fly ash as a partial replacement for cement in pavement mix designs, at the rate specified in this paragraph will be allowed at the Contractor's option. Pozzolanic admixtures shall be fly ash meeting the requirements of ASTM C-618, Type C except loss on ignition shall not exceed three (3) percent. When fly ash is used as a partial replacement for cement, the minimum cement content may be met by considering portland cement plus fly ash as the total cementitious component. The replacement rate should not exceed 15 percent.

PART 3 – EXECUTION

3.1 EQUIPMENT:

Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site before the start of construction operations for examination and approval.

A. Batching Plant and Equipment

1. General: The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and coarse aggregate. If bulk cement is used, a bin, hopper, and a separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation.
2. Bins and Hopper. Bins with adequate separate compartments for fine aggregate and coarse aggregate shall be provided in the batching plant. Each compartment shall discharge efficiently and freely into the weighing hopper.

Means of control shall be provided so that, as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. A port or other opening for removing an overload of any one of the several materials from the hopper shall be provided. Weighing hoppers shall be constructed to eliminate accumulations of materials and to discharge fully.

3. Scales. The scales for weighing aggregates and cement shall be of either the beam or the springless dial type. They shall be accurate within 0.5 percent throughout their range of use. When beam-type scales are used, provisions such as a "telltale" dial shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on the weighing beams shall clearly indicate critical position. Poises shall be designed to be locked in any position and to prevent unauthorized change. The weight beam and "telltale" device shall be in full view of the operator while charging the hopper, and the operator shall have convenient access to all controls. Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy. The Contractor shall have on hand not less than ten 50-pound (23 kg) weights for testing of all scales when directed by the Engineer.

B. Mixers.

1. General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. A device accurate within 3 percent and satisfactory to the Engineer shall be provided at the mixer for determining the amount of air-entraining agent or other admixture to be added to each batch requiring such admixtures. Mixers shall be examined daily for the accumulation of hard concrete or mortar and the wear of blades.
2. Central Plant Mixer. Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging the mixture without segregation. Central plant mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed. The water system for a central mixer shall be either a calibrated measuring tank or a meter and shall not necessarily be an integral part of the mixer. The mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4-inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

3. Truck Mixers and Truck Agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

C. Finishing Equipment.

1. Finishing Machine. The finishing machine shall be equipped with one or more oscillating-type transverse screeds.
2. Vibrators. For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches (20 cm) thick or the internal type with either immersed tube or multiple spuds, for the full width of the concrete slab. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, load-transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall not be less than 3,500 vibrations per minute, and the frequency of the internal type shall not be less than 7,000 vibrations per minute for spud vibrators. When spud-type internal vibrators are used adjacent to the side forms, they shall have a frequency of not less than 3,500 vibrations per minute. Hand vibrators should be used to consolidate the concrete along forms and other isolated areas. For slip-form construction, the paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators with a frequency range variable between 7,000 and 12,000 vibrations per minute. The amplitude of vibration shall be between 0.025 (0.6 mm) and 0.06 (1.5 mm) inches. The number, spacing, frequency, and eccentric weights shall be provided as necessary to achieve an acceptable concrete density and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the concrete. The frequency of surface vibrators shall not be less than 3,500 vibrations per minute. The Contractor shall furnish a tachometer or other suitable device for measuring the frequency of the vibrators. The vibrators and tamping elements shall be automatically controlled so that they shall be stopped as forward motion ceases. Any override switch shall be of the springloaded, momentary contact type. For hand placed pavement the contractor shall consolidate concrete with the use of a hand held vibrator regardless of the type of strike off machinery used. Vibration shall be done to sufficiently remove air voids and consolidate concrete around reinforcing steel and side forms. **VIBRATORS SHALL NOT BE USED TO DISTRIBUTE CONCRETE.** The contractor shall limit disturbances of consolidated concrete during strike-off and finishing by using adequately sized floats and straight edges as approved by the Engineer. Vibrators, floats, and finishing tools to be on job site at all times during concrete placement.
3. Concrete Saw. When sawing of joints is specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor

- shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and at all times during concrete placement.
4. Forms. Straight side forms shall be made of steel having a thickness of not less than 7/32 inch (6 mm) and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete without horizontal joint, and a base width equal to the depth of the forms. Flexible or curved forms of proper radius shall be used for curves of 100-foot (31 m) radius or less. Flexible or curved forms shall be of a design acceptable to the Engineer. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Flange braces shall extend outward on the base not less than two-thirds the height of the form. Forms with battered top surfaces and bent, twisted, or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4-inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting.
 5. Slip-form Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

3.2 FORM SETTING:

Forms shall be set sufficiently in advance of the concrete placement to insure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than 3 pins for each 10-foot (3 m) section. A pin shall be placed at each side of every joint. Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4-inch (6 mm) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete. The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately

before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

3.3 CONDITIONING OF UNDERLYING COURSE AND REINFORCING:

The prepared grade shall be well moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Ruts or depressions in the subgrade or subbase caused by hauling or usage of other equipment shall be filled as they develop with suitable material (not with concrete or concrete aggregates) and thoroughly compacted by rolling. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor, or the damaged areas filled with concrete integral with the pavement. All excess material shall be removed. Low areas may be filled and compacted to a condition similar to that of the surrounding grade, or filled with concrete integral with the pavement. In cold weather, the underlying subbase shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. The work described under the foregoing paragraphs does not constitute a regular subgrading operation, but rather a final accurate check of the underlying course. Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale, or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements and provided the rust or scale is not loose. Reinforcing bars shall be securely wired together at all intersections and splices and shall be securely wired to each dowel and load transmission unit intersected. All bars shall be installed in their required position as shown on the plans.

3.4 MIXING CONCRETE:

The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94, except that the minimum required revolutions of the mixing speed for transit mixed concrete may be reduced to not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer. When mixed at the work site or in a central mixing plant, the mixing time shall not be less than 50 seconds nor more than 90 seconds. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein. The mixer shall be operated at the drum speed as shown on the manufacturer's nameplate on the approved mixer. Any concrete mixed less than

the specified time shall be discarded at the Contractor's expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet (cubic meters), as shown on the manufacturer's standard rating plate on the mixer. An overload up to 10 percent above the mixer's nominal capacity may be permitted provided concrete test data for segregation and uniform consistency are satisfactory, and provided no spillage of concrete takes place. The batch shall be charged into the drum so that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum. Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 60 minutes when the concrete is hauled in truck mixers or truck agitators. Re-tempering concrete by adding water or by other means will not be permitted, except when concrete is delivered in transit mixers. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Engineer. All these operations must be performed within 45 minutes after the initial mixing operations and the water-cement ratio must not be exceeded. Admixtures for increasing the workability or for accelerating the set will be permitted only when specified for in the contract.

3.5 LIMITATIONS OF MIXING:

No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40 degrees F (4 degrees C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35 degrees F (2 degrees C). When concreting is authorized during cold weather, the aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials. Unless otherwise authorized, the temperature of the mixed concrete shall not be less than 50 degrees F (10 degrees C) at the time of placement in the forms. If the air temperature is 35 degrees F (2 degrees C) or less at the time of placing concrete, the Engineer may require the water and/or the aggregates to be heated to not less than 70 degrees F (21 degrees C) nor more than 150 degrees F (66 degrees C). Concrete shall not be placed on frozen subgrade nor shall frozen aggregates be used in the concrete. During periods of warm weather when the maximum daily air temperature exceeds 85 degrees F (30 degrees C), the

following precautions should be taken. The forms and/or the underlying material shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90 degrees F (32 degrees C). The aggregate and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

3.6 PLACING CONCRETE:

- A. Side-form Method: For the side-form method, the concrete shall be deposited on the moistened grade to require as little re-handling as possible. Unless truck mixers, truck agitators, or non-agitating hauling equipment are equipped with means for discharge of concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels- NOT RAKES. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances. Concrete for side-form construction shall be placed on cement treated base. No concrete shall be placed before the cement treated base has obtained a compressive strength specified at 7 days. When concrete is to be placed adjoining a previously constructed lane of pavement and when mechanical equipment will be operated upon the existing lane of pavement, the concrete shall be at least 7 days old and at a flexural strength approved by the Engineer. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after 3 days, if approved by the Engineer. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 15 seconds in any one location, nor shall the vibrators be used to move the concrete. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly. Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.
- B. Slip Form Method. For the slip-form method, the concrete shall be placed with an approved crawler-mounted, slip-form paver designed to spread, consolidate, and shape the freshly placed concrete in one complete pass of the machine so that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with requirements of the plans and specifications. The concrete should be placed directly on top of the joint assemblies to prevent them from moving when the paver moves over them. Side forms and finishing screeds shall be adjustable to the extent required to

produce the specified pavement edge and surface tolerance. The side forms shall be of dimensions, shape, and strength to support the concrete laterally for a sufficient length of time so that no appreciable edge slumping will occur. Final finishing shall be accomplished while the concrete is still in the plastic state. Concrete for slip form construction shall be placed on cement treated base or lime stabilized subgrade. No concrete shall be placed before the cement treated base has obtained the compressive strength specified at 7 days. The Contractor shall set grade stakes and stringline for each lane placement. The stringline shall be supported at intervals of not more than 25 feet. Additional supports shall be installed to prevent sag of the stringline. The horizontal alignment of the stringline shall be within plus or minus 1/4-inch in 10 feet of true alignment. The Contractor shall provide a suitable method of securing the stringline to maintain proper grade where vertical curves are to be constructed.

- C. Hand Placement Method. When the hand method of striking off and consolidating is permitted, the concrete, as soon as placed, shall be approximately leveled and then struck off and screeded to such elevation above grade that, when consolidated and finished, the surface of the pavement shall be at the grade elevation shown on the plans. The entire surface shall then be tamped and the concrete consolidated so as to insure maximum compaction and a minimum of voids. For the strike off and consolidation, both a strike template and tamping template shall be provided on the work. In operation the strike template shall be moved forward with a combined longitudinal and transverse motion and so manipulated that neither end of the template is raised from the forms during the striking-off process. A slight excess of material shall be kept in front of the cutting edge at all times. The straightedging, surfacing and joint finishing shall be as described herein.

3.7 STRIKE-OFF OF CONCRETE:

Following the placing of the concrete, it shall be struck off to conform to the cross section shown on the plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. All reinforcement shall be positioned in advance of concrete placement. All reinforcing bars and bar mats shall be installed in the slab at the required depth below the finished surface and supported by chairs installed on 4-foot centers. After the reinforcing steel is securely installed above the subgrade, as specifically required by plans and as herein prescribed, there shall be no loading imposed upon (or walking upon) the bar mats or individual bars that will cause deformation of reinforcing before or during the placing or finishing of the concrete.

3.8 JOINTS.

- A. General:

1. Longitudinal and Transverse Joints. Longitudinal and transverse joints shall be constructed as indicated on the plans and in accordance with these requirements. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement. Joints shall not vary more than 1/2-inch (13 mm) from a true line or from their designated position. The vertical surface of the pavement adjacent to all expansion joints shall be finished to a true plane and edged to a radius of 1/4-inch (6 mm) or as shown on the plans. The surface across the joints shall be tested with a 10-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4-inch (6 mm) shall be corrected before the concrete has hardened. Longitudinal construction joints that do not meet these requirements or which show significant cracking or planes of weakness shall be sawed-off full depth at the Contractor's expense using the minimum practical width at locations designated by the Engineer. When required, keyways shall be accurately formed with a template of metal or wood. The gauge or thickness of the material in the template shall be such that the full keyway, as specified, is formed and is in the correct location. Transverse joints shall be right angles to the centerline of the pavement and shall extend the full width of the slab. All joints shall be so prepared, finished, or cut to provide a groove of the width and depth shown on the plans.
2. Tie Bars: Tie bars shall consist of deformed bars installed principally in longitudinal joints as shown on the plans or the bars shall be extensions of the distributed reinforcing steel across the joints. Tie bars shall be placed at right angles to the centerline of the concrete slab. They shall be held in position parallel to the surface and midway between the surfaces of the slab. These bars shall not be painted, greased, or enclosed in sleeves. At all locations where tie bars are specified and where pavement is in place, the tie bars shall be inserted by drilling and grouting with approved epoxy material. Tie bars in longitudinal construction joints may be installed by bending the bars flush with a keyed joint.
3. Dowel Bars: If used, dowel bars or other load-transfer units of an approved type shall be placed across transverse or other joints in the manner as specified on the plans. They shall be of the dimensions and spacing as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. A metal, or other type, dowel expansion cap or sleeve shall be furnished for each dowel bar used with expansion joints. These caps shall be substantial enough to prevent collapse and shall be placed on the ends of the dowels as shown on the plans. The caps or sleeves shall fit the dowel bar tightly and the closed end shall be watertight.

- B. Installation: Joints in concrete pavements shall be cut as shown on the plans. Equipment shall be as described in Paragraph 3.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least

1/8-inch (3 mm) wide and to the depth shown on the plans. When shown on the plans or required by the specifications, the top portion of the slot or groove shall be widened by means of a second shallower cut or by suitable and approved beveling to provide adequate space for joint sealers. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing. Sawing shall be carried on both during the day and night as required. The joints shall be sawed at the required spacing consecutively in sequence of the concrete placement, unless otherwise approved by the Engineer.

C. Longitudinal Joints.

1. Construction. Longitudinal construction joints shall be formed against suitable side forms (usually made of steel) with or without keyways. Wooden forms may be used under special conditions, when approved by the Engineer. Where butt-type joints with dowels are designated, the dowels for this type shall be painted and greased. The edges of the joint shall be finished with a grooving tool or edging tool, and a space or slot shall be formed along the joint of the dimensions, as indicated, to receive the joint sealing material. Longitudinal construction joints shall be sawed to provide a groove at the top conforming to the details and dimensions indicated on the plans. Provisions shall be made for the installation of tie bars as noted on the plans.
2. Contraction or Weakened-plane type. The longitudinal groove sawed in the top of the slab shall be installed where indicated on the drawings. The groove shall be sawed with approved equipment in the hardened concrete to the dimensions required. The sawed groove shall be straight and of uniform width and depth. The groove shall be clean cut so that spalling will be avoided at intersections with transverse joints. Tie bars or distributed reinforcing steel shall be installed across these joints where indicated on the plans.
3. Expansion. Longitudinal expansion joints shall be installed as indicated on the plans. The premolded filler, of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic.

D. Transverse Joints.

1. Expansion. Transverse expansion joints shall be installed at the locations and spacing as shown on the plans. The joints shall be installed at right angles to the centerline and perpendicular to the surface of the pavement. The joints shall be installed and finished to insure complete separation of the slabs.

- Expansion joints shall be of a premolded type conforming to these specifications and with the plans and shall be the full width of the pavement strip. All concrete shall be cleaned from the top of the joint material. Before the pavement is opened to traffic, this space shall be swept clean and filled with approved joint sealing material. All devices used for the installation of expansion joints shall be approved by the Engineer. They shall be easily removable without disturbing the concrete and held in proper transverse and vertical alignment. Immediately after forms are removed, any concrete bridging the joint space at the ends shall be removed for the full width and depth of the joint. When specified, expansion joints shall be equipped with dowels of the dimensions and at the spacing and location indicated on the plans. The dowels shall be firmly supported in place and accurately aligned parallel to the subgrade and the centerline of the pavement by means of a dowel assembly which will remain in the pavement and will ensure that the dowels are not displaced during construction. Other types of load-transfer devices may be used, when approved by the Engineer.
2. Contraction. Transverse contraction joints, weakened-plane joints, or both, shall be installed at the locations and spacing as shown on the plans. These joints will be installed by sawing a groove into the concrete surface after the concrete has hardened in the same manner as specified in Paragraph 3.8(c)(2). Dowel bar assemblies shall be installed, when required, as shown on the plans.
 3. Construction. Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. When the installation of the joint can be planned in advance, it shall be located at a contraction or expansion joint. The joint shall not be allowed within 8 feet (2.4 m) of a regular spaced transverse joint. If the pouring of the concrete has been stopped, causing a joint to fall within this limit, it shall not be installed, and the fresh placed concrete shall be removed back to the 8 foot (2.4 m) limit.

3.9 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING:

- A. Sequence. The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straightedging, and final surface finish. The addition of superficial water to the surface of the concrete to assist in finishing operations generally will not be permitted. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.
- B. Finishing at Joints. The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material; it shall be firmly placed without voids or segregation under and around all load-transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated. After the concrete

has been placed and vibrated adjacent to the joints, the finishing machine shall be operated in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the finishing machine, to, over, and beyond the joints, cause segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the screed is approximately 8 inches (20 cm) from the joint. Segregated concrete shall be removed from the front of and off the joint; the screed shall be lifted and set directly on top of the joint, and the forward motion of the finishing machine shall be resumed. Thereafter, the finishing machine may run over the joint without lifting the screed, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

- C. Machine Finishing. The concrete shall be spread as soon as it is placed, and it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area as many times and at such intervals as necessary to give the proper consolidation and to leave a surface of uniform texture. Excessive operation over a given area shall be avoided. When side forms are used, the tops of the forms shall be kept clean by an effective device attached to the machine, and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish. During the first pass of the finishing machine, a uniform ridge of concrete shall be maintained ahead of the front screed for its entire length. When in operation, the screed shall be moved forward with a combined longitudinal and transverse shearing motion, always moving in the direction in which the work is progressing, and so manipulated that neither end is raised from the side forms during the striking-off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross section, and free from porous areas.
- D. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade; in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used. The screed for the surface shall be at least 2 feet (0.6 m) longer than the maximum width of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its shape, and shall be constructed either of metal or of other suitable material covered with metal. Wood will not be permitted. Consolidation shall be attained by the use of a suitable vibrator.
- E. Floating. After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, using one of the following methods:
1. Hand Method. The hand-operated longitudinal float shall not be less than 12 feet (3.6 m) in length and 6 inches (15 cm) in width, properly stiffened to

- prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the slab centerline and passing gradually from one side of the slab to the other. Forward movement along the centerline of the slab shall be in successive advances of not more than one-half the length of the float. Any excess water or soup material shall be wasted over the slab edge on each pass.
2. Mechanical Method. The Contractor may use a machine composed of a cutting and smoothing float(s), suspended from and guided by a rigid frame. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms or pavement subgrade. If necessary, long-handled floats having blades not less than 5 feet (1.5 m) in length and 6 inches (1.5 cm) in width may be used to smooth and fill in open-textured areas in the slab. Long-handled floats shall not be used to float the entire surface of the slab in lieu of mechanical methods. After floating, any excess water and laitance shall be removed from the surface of the slab by a straightedge 10 feet (3 m) or more in length. Successive drags shall be lapped one-half the length of the blade.
- F. Straight-edge Testing and Surface Correction. After the pavement has been struck off and consolidated and while the concrete is still plastic, it shall be tested for trueness with a 16-foot (4.8 m) straightedge. For this purpose the Contractor shall furnish and use an accurate 16-foot (4.8 m) straightedge swung from handles 3 feet (0.4 m) longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance shall be removed from the surface of the pavement. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

3.10 SURFACE TEXTURE:

A light broom drag shall be used for slab concrete pavements. The direction of the texture device shall be as directed by the Engineer. Contractor to match existing pavement finishes.

3.11 SURFACE TEST:

As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 16-foot (5 m) straightedge or other specified device to determine its compliance with design grades. Where the departure from correct cross section exceeds ½ inch (13 mm), the pavement shall be ground down with an approved grinding machine to within 1/4 inch of tolerance or removed and replaced at the expense of the Contractor when so directed by the Engineer. Cracked or damaged slabs shall be removed and replaced at the expense of the Contractor when so directed by the Engineer. Any area or section so removed shall not be less than 20 feet (6 m) in length or less than the full width of the lane involved, whichever is greatest. When it is necessary to remove and replace a section of pavement, and remaining portion of a slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

3.12 CURING:

Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured in accordance with one of the methods below. In all cases in which curing requires the use of water, the curing shall have prior right to all water supply or supplies. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period. The following are alternate approved methods for curing concrete pavements.

- A. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of 1 gallon (4 liters) to not more than 150 square feet (14 square meters). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed, but approved means shall be used to insure proper curing for 72 hours. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound. Upon removal of the side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. For the Impervious Membrane Method, the Contractor is encouraged to include Polyethylene Film dispensing equipment in

the Paving Train to provide protection to the finished work in case of rainfall.

- B. Polyethylene Films. The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units shall be lapped at least 18 inches (457 mm). The sheeting shall be placed and weighted to cause it to remain in contact with the surface covered. The sheeting shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the pavement. Unless otherwise specified, the sheeting shall be maintained in place for 72 hours after the concrete has been placed.
- C. Waterproof Paper. The top surface and sides of the pavement shall be entirely covered with waterproofed paper. The units shall be lapped at least 18 inches (457 mm). The paper shall be placed and weighted to cause it to remain in contact with the surface covered. The paper shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the slab. The surface of the pavement shall be thoroughly wetted prior to placing of the paper. Unless otherwise specified, the paper shall be maintained in place for 72 hours after the concrete has been placed.
- D. White Burlap-Polyethylene Sheets. The surface of the pavement shall be entirely covered with sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully wetted and in position for 72 hours after the concrete has been placed.
- E. Curing in Cold Weather. When the average daily temperature is below 40 degrees F (4 degrees C), curing shall consist of covering the newly laid pavement with not less than 12 inches (30 cm) of loose, dry hay or straw, or equivalent protective curing authorized by the Engineer, which shall be retained in place for 10 days. The hay or straw shall be secured to avoid being blown away. Admixture for curing or temperature control may be used only when authorized by the Engineer. When concrete is being placed and the air temperature may be expected to drop below 35 degrees F (2 degrees C), a sufficient supply of straw, hay, grass, or other suitable blanketing material such as burlap or polyethylene shall be provided along the work. Any time the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete. The period of time such protection shall be maintained shall not be less than 10 days. A minimum of 3 days is required when high, early strength concrete is used. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

3.13 REMOVING FORMS:

Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has set for at least 12 hours, except where auxiliary forms are used temporarily in widened areas. Forms shall be removed carefully to avoid damage to the pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated in Paragraph 3.17. Major honeycombed areas shall be considered as defective work and shall be removed and replaced. Any area or section so removed shall not be less than 20 feet (6 m) in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

3.14 SEALING JOINTS:

The joints in the pavement shall be prepared and sealed in strict accordance with the sealant manufacturer's printed recommendations.

3.15 PROTECTION OF PAVEMENT:

The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, or crossovers, etc. The plans or special provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense. In order that the concrete be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor is encouraged to have available at all times materials for the protection of edges and surface of the unhardened concrete. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel should begin covering the surface of the unhardened concrete with the protective covering.

3.16 OPENING TO TRAFFIC:

The Engineer shall decide when the pavement shall be opened to traffic. The pavement will not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 pounds per square inch (3792 kPa) when tested in accordance with ASTM C78. If such tests

are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening to traffic, the pavement shall be thoroughly cleaned.

3.17 SURFACE AND THICKNESS TOLERANCES:

Extreme care must be exercised in all phases of the operation to assure the pavement will pass the specified tolerances. The following tolerances are applicable:

- A. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot (30 mm) in any lane.
- B. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot (12 mm) at any point.
- C. Surface smoothness deviations shall not exceed 3/8 inch (6 mm) from a 16-foot (5 m) straightedge placed in any direction, including placement along and spanning any pavement joint or edge. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by plans.

3.18 INTEGRAL CURBS:

Where shown on the drawings, integral curbs shall be installed to the dimension shown using identical concrete to the paving mix. Expansion and contraction joints shall extend through curb section. Reinforcing for integral curb, when shown on the plans, shall be supported from the ground with driven stakes or as directed by the Engineer. Once the forms are removed, all voided areas shall be rubbed and filled with non-shrink grout within 24 hours. If the forms are removed within 2 days of placement, the curb shall be treated with a specified curing membrane.

3.19 CONCRETE CURB AND GUTTER:

Concrete curb and gutter shall be constructed using concrete of the type and strength specified in the plans. The placement, strike-off consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be placed at 20-foot centers with the use of a 1/2" deep grooving tool. Expansion joints shall be placed at a maximum spacing of 400 feet and at all radius points, curb returns and junctions with structures. For curves of 100 feet radius or less, contraction joints shall be tooled at 10-foot centers and expansion joints constructed at 50-foot centers. Expansion joints shall contain a minimum of two smooth dowels a minimum of one bar size larger than the longitudinal reinforcing and 3/4-inch thick expansion joint material of the type specified in the plans. Expansion joints shall be sealed in accordance with the plan details.

3.20 SIDEWALKS AND SLOPE PAVING:

Concrete sidewalks and slope paving shall be constructed to use concrete of the type and strength specified in the plans. The placement, strike-off, consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be tooled at a depth of 1/2" at spacing equal to the width of the sidewalk, not to exceed six feet maximum. For walks wider than six feet, longitudinal joints shall be tooled at equal spacing, not less than three feet. Edges shall be tooled with a 1/4-inch radius and finish slightly higher than adjacent curbs to ensure proper drainage if some settlement occurs. Expansion joints shall be placed at 100-foot intervals or at intersecting walk locations. Expansion joints shall be 3/4-inch in thickness and contain smooth dowels at not less than 12" spacing. The size of the dowels will be equal to the thickness of the sidewalk in inches. Scoring and tooling for barrier free ramps shall be made in accordance with governing City standards or as directed by the Engineer.

3.21 FIELD TEST SPECIMENS:

Concrete samples shall be furnished by the Contractor and shall be taken in the field to determine the consistency, air content, and strength of the concrete. Compressive test cylinders shall be made each day that the concrete is placed. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test cylinders may be required until the Engineer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages will be 7 days and 28 days. Test cylinders for compressive strength tests shall be taken and cured in accordance with ASTM C-31 and tested in accordance with ASTM C-39. At least four cylinders (a set) shall be made for each 50 cubic yards or fraction thereof placed and tested at 7 days and 28 days. No extra compensation will be allowed for materials and work involved in fulfilling these requirements.

Concrete will be accepted on the basis of tests conducted on a "lot" of concrete. A lot will consist of 200 cubic yards and will be divided into four equal sublots. One set of tests will be made for each subplot. Random samples will be taken from the plastic concrete at the site in accordance with accepted statistical procedures.

The concrete shall be sampled in accordance with ASTM C172. The lot will be accepted without adjustment in payment if the average 28 day compressive strength, based on four acceptance tests, indicates a strength deficiency of not less than 100 psi. The pay factor for 28-day compressive strengths showing a deficiency greater than 100 psi are listed in the table below.

PAY FACTOR SCHEDULE FOR COMPRESSIVE STRENGTH

AT THE SPECIFIED INTERVAL

Strength Deficiency (Based on an Average of 4 Cylinders)	Pay Factor (Percent of Contract Unit Price)
psi	psi
0 - 100	100
101 - 150	85
151 - 200	75
201 - 250	70
251 - 300	60
301 - 375	55
376 - 500	50
> 500	Reject

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT:

- A. Concrete Pavement\Slab: The area of new pavement to be paid for shall be the number of square yards of various types and thickness of Concrete Pavement as specified, in place, complete and accepted, less deductions, as herein before described for deficient thickness or strength, including any thickened edges as shown on the plans.
- B. Curbs. Integral Curb or Curb and Gutter of the type and size specified shall be measured per linear foot complete in place excluding the face of inlets, but including transitions at recessed inlets.
- C. Headers. Concrete Pavement Headers shall be measured per linear foot complete in place.
- D. Sidewalks. Sidewalks shall be measured by the square foot of the thickness specified, complete and accepted in place, with or without lugs.

4.2 PAYMENT:

- A. The work performed and materials furnished under this section and measured as provided under Measurement will be paid for at the unit price bid per the bid proposal of the type and thickness as specified, or the adjusted unit price for payment of deficient thickness or strength as provided herein, which price shall be full compensation for shaping, furnishing, and applying all water required; for furnishing, loading, and unloading, storage, hauling and handling all concrete ingredients, and all freight and royalty involved; for mixing, placing, finishing, sawing, cleaning and sealing joints, and curing all concrete, for furnishing and installing all reinforcing steel; for furnishing all materials for sealing joints, steel

dowel caps and load transmission devices required and wire and devices for placing, holding and supporting the steel bars, load transmission devices and joint filler material in proper position; for coating steel bars when required by the plans and for all manipulations, labor, equipment, appliances, tools, traffic provisions, and incidentals necessary to complete the work.

END OF SECTION

SECTION 02640 CONCRETE SIDEWALKS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This item shall govern the installation of sidewalks, with reinforcing steel, composed of Portland Cement concrete, constructed on an approved subgrades in conformity with the lines and grades established by the plans and details, and for the disposal of all material obtained from such installation. The work to be done under this item shall include all necessary forming, compaction, concrete work, and the removal of all structures or portions thereof such as trees, brush, mail boxes, and all other obstructions necessary to the proposed construction.

PART 2 - MATERIAL

2.01 Concrete

- A. Materials and proportions used in construction under this item shall conform to the requirements of Class "A" Concrete 4 ½ 5 sack cement mix and shall have a minimum compressive 28 days strength of 3,000 pounds per square inch.
- B. Reinforcing Steel - The reinforcing steel shall be a welded wire fabric made from cold-drawn wire smooth with a minimum yield strength of 56,000 pounds per square inch. The style designation shall be 6" x 6" x W 1.4 or Equal. (6" x 6" No. 10 6).

PART 3 - CONSTRUCTION METHOD

- A. The subgrade shall be excavated and shaped to line, grade and cross section and if considered necessary in the opinion of the ENGINEER, place 2" of sand cushion, hand tamped and sprinkled. The subgrade shall be moist at the time the concrete is placed.
- B. Forms shall be of wood or metal, 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.
- C. The reinforcing steel shall be placed in position as shown on the plans. Care shall be taken to keep all reinforcing steel in its proper locations.
- D. Sidewalks shall be constructed in sections of the lengths shown on plans. The different sections shall be separated by 2 pre-molded or board joint of the thickness shown on the plans, placed vertically and at right angles to the longitudinal axis of the sidewalk. Where the sidewalk abuts a curb or retaining

wall, approved expansion material shall be placed along their entire length. Similar expansion material shall be placed around all obstructions protruding through sidewalk.

- E. 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 to the satisfaction of the Engineer.
- F. Sidewalks shall be marked into sections, each 6 feet maximum in length, by the use of approved jointing tools.
- G. When completed, the, sidewalks shall be cured in accordance with the requirements of the Item, "Membrane Curing", Type 2, white pigmented.

PART 4 - PAYMENT

- A. The work performed and materials furnished as prescribed by the item shall be measured by the square foot of surface area of completed sidewalk. This item will be paid for at contract unit price bid for "Concrete Sidewalks", which price shall be full compensation for preparing the subgrade; for furnishing and placing all materials, including all reinforcing steel and expansion joint materials; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

END OF SECTION

SECTION 02680 FLAT WHEEL ROLLING

PART 1- GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of the compaction of subgrade, embankment, flexible base, surface treatments and asphalt surfaces by the operation of an approved power roller as herein specified and as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 EQUIPMENT:

A. Embankments and Flexible Bases

1. Power rollers shall be of the 3-wheel, self-propelled type, weighing not less than 10 tons and shall provide a compression on the rear wheels of not less than 325 pounds per linear foot of wheel width. All wheels shall be flat.
2. The rear wheels shall have a diameter of not less than 48 inches and each shall have a wheel width of not less than 20 inches.

B. Surface Treatments and Pavements

1. Power rollers shall be the 3-wheel or tandem, self-propelled type, weighing not less than 3 tons nor more than 6 tons. All wheels shall be flat.
2. Rollers shall be equipped with an adequate scraping or cleaning device on each wheel.
3. Rollers used to compact asphalt mixture shall be equipped with a water system which will keep all tires uniformly wet.
4. In lieu of the rolling equipment specified, the CONTRACTOR may operate other compacting equipment that will produce equivalent relative compaction in the same period of time as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction within the same period of time, its use shall be discontinued.
5. Rollers shall be maintained in good repair and operating condition and shall be approved by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

A. Subgrades, Embankments and Flexible Base

1. The subgrade, embankment layer, or the base course shall be sprinkled if directed. Rolling with a power roller shall start longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the rear wheel of the power roller.
2. On super-elevated curves, rolling shall begin at the low sides and progress toward the high sides. Alternate trips of the roller shall be slightly different in length.
3. The rollers, unless otherwise directed, shall be operated at a speed between 2 and 3 miles per hour.

B. Surface Treatments and Pavements

1. Rolling shall be done to produce a satisfactory surface as called for in surface treatment and pavement items.
2. The sequence of work shall be as indicated for embankment layer or base course.
3. The operating speed shall be determined by the CONTRACTOR.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional compensation will be made for materials, equipment or labor required by this item, and shall be considered incidental to the other items included in the contract.

END OF SECTION

SECTION 02682 PNEUMATIC TIRE ROLLING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of the compaction of embankment, flexible base, surface treatments, or pavements by the operation of approved pneumatic tire rollers.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

- A. When used on seal coats, asphaltic surface treatments, and bituminous mixture pavements, the roller shall be self-propelled and equipped with smooth tread tires with a tire pressure of 45 psi.
- B. The roller shall be so constructed as to be capable of being operated in both a forward and a reverse direction.
- C. When used on bituminous mixture pavements, the roller shall have suitable provision for moistening the surface of the tires while operating.
- D. When turning is impractical or detrimental to the work and when specifically directed by the ENGINEER, the roller shall be of the self-propelled type.
- E. In lieu of the rolling equipment specified, the CONTRACTOR may operate other compacting equipment that will produce equivalent relative compaction in the same period of time as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction within the same period of time, its use shall be discontinued.
- F. Rollers shall be maintained in good repair and operating condition and shall be subject to approval of the ENGINEER.

2.02 LIGHT PNEUMATIC TIRE ROLLER:

- A. The light pneumatic tire roller shall consist of not less than 9 pneumatic tire wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group, mounted in a rigid frame, and provided with a loading platform or body suitable for ballast loading.
- B. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle.

- C. Under working conditions the pneumatic tire roller shall have an effective rolling width of approximately 60 inches and shall be so designed that by ballast loading the total load can be varied uniformly from 9,000 pounds to 18,000 pounds.
- D. The roller shall be equipped with tires that will afford ground contact pressures to 45 pounds per square inch or more. The operating load and tire air pressure shall be within the range of the manufacturer's chart. The roller under working conditions shall provide a uniform compression under all wheels.
- E. Individual tire inflation pressures shall be within +5 psi of each other.
- F. The pneumatic tire roller shall be drawn by a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type and the roller, when drawn or propelled by either type of equipment, shall be considered a light pneumatic tire roller unit.

2.03 MEDIUM PNEUMATIC TIRE ROLLER (TYPE A):

- A. The medium pneumatic tire roller (Type A) shall consist of not less than 7 pneumatic tired wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading.
- B. The front axles shall be attached to the frame in such a manner that the roller may be turned within a minimum circle. The pneumatic tire roller, under working conditions, shall have an effective rolling width of approximately 84 inches and shall be so designed that, by ballast loading, the total load may be varied uniformly from 23,500 pounds to 50,000 pounds.
- C. The roller shall be equipped with tires that will afford ground contact pressures to 80 pounds per square inch or more. Individual tire inflation pressures shall be within +5 psi of each other.
- D. The operating load and tire air pressure shall be within the range of the manufacturer's chart.
- E. The pneumatic tire roller shall be drawn by a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type.
- F. The roller, when drawn or propelled by any type of equipment, shall be considered a medium pneumatic tire roller unit.

- G. The power unit shall have adequate tractive effort to properly move the operating roller at variable uniform speeds up to approximately 5 miles per hour.

2.04 MEDIUM PNEUMATIC TIRE ROLLER (Type B):

- A. The medium pneumatic tire roller (Type B) shall conform to the requirements for Medium Pneumatic Tire Roller (Type A) as specified above, except that the roller shall be equipped with tires that will afford ground contact pressures to 90 psi or more.

PART 3 -EXECUTION

3.01 CONSTRUCTION METHODS:

- A. The embankment layer or the base course be sprinkled if directed and rolling with a pneumatic tire roller shall start longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 of width of the pneumatic tire roller.
- B. On super-elevated curves, rolling shall begin at the low sides and progress towards the high sides.
- C. Alternative trips of the roller shall be slightly different in length.
- D. The light pneumatic tire roller shall be operated at speeds between 2 and 6 miles per hour for asphalt surfacing work and all other work.
- E. The medium pneumatic tire roller shall be operated at speeds which produce a satisfactory product.
- F. Sufficient rollers shall be provided to compact the material in a satisfactory manner. When operations are so isolated from one another that 1 roller unit cannot perform the required compaction satisfactorily, additional roller units shall be provided.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional compensation will be made for materials, equipment or labor required by this item, but shall be considered subsidiary to the various items of the contract.

END OF SECTION

SECTION 02686 PROOF ROLLING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION WORK:

- A. This work shall consist of furnishing and operating heavy, pneumatic-tired, compaction equipment for testing the compaction of embankment, subgrade or flexible base.
- B. Proof roll is to be used to locate unstable areas.

PART 2 - PRODUCTS

2.01 EQUIPMENT:

- A. The proof rolling equipment shall consist of not less than 4 pneumatic tired wheels, running on axles carrying not more than 2 wheels, mounted in a rigid frame, and provided with a loading platform or a body suitable for ballast loading.
- B. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces.
- C. Under working conditions the proof roller shall have a rolling width of 8 feet to 10 feet and shall be so designed that by ballast loading the gross load may be varied uniformly from 25 tons to 50 tons.
- D. The tires shall be capable of operating under the various loads with variable air pressure up to 150 pounds per square inch. The operating load and tire pressure shall be within the range of the manufacturer's chart and as directed by the ENGINEER.
- E. The proof roller may be of the self-propelled type or shall be drawn by a suitable crawler-type tractor or a rubber tired tractor of adequate tractive effort. There shall be a sufficient quantity of ballast available to load the equipment to a maximum gross weight of 50 tons.
- F. Rubber tired tractive equipment shall be used on base courses.
- G. Other type tractive equipment may be used on embankment subgrade.
- H. The heavy pneumatic tired roller unit shall be capable of turning 180 degrees in the crown width.

In lieu of the rolling equipment specified, the CONTRACTOR may, upon written permission from the ENGINEER, operate other equipment that will produce equivalent results as the specified equipment. If the substituted equipment fails to produce the desired results as would be expected of the specified equipment as determined by the ENGINEER, its use shall be discontinued.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. This work shall be done to proof all prepared subgrade and flexible base courses or as directed by the ENGINEER.
- B. On embankment compaction, each layer will be placed to specified thickness at optimum moisture and compacted with conventional equipment to comply with the requirements of the governing embankment item.
- C. Prior to placing the overlaying course, the layer shall be proof rolled as directed by the ENGINEER.
- D. When the operation of the proof rolling unit shows an area to be unstable or nonuniform, such area shall be brought to satisfactory stability and uniformity by additional compaction or by removal of unsuitable materials and replacement with suitable materials and re-compacted.
- E. The surface tested shall then be checked for conformity with line and grade and any irregularities corrected.
- F. Roller shall be operated at speeds between 2 and 6 miles per hour or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT:

- A. No additional payment will be made for the materials, equipment or labor required by this item and shall be considered subsidiary to the various items included in the contract.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK COVERED:

- A. Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.02 QUALITY ASSURANCE:

- A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes. Applicable standards and codes include, but are not limited to, the following:
 - 1. ASTM A36 - Structural Steel.
 - 2. ASTM C33 - Concrete Aggregates.
 - 3. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
 - 4. ASTM C94 - Ready-Mixed Concrete.
 - 5. ASTM C143 - Slump of Portland Cement Concrete.
 - 6. ASTM C150 - Portland Cement Concrete.
 - 7. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 8. ACI 301 - Specification for Structural Concrete for Building.
 - 9. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 10. ACI 315 - Manual of Standard practice for Detailing.
 - 11. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 12. ACI 347 - Recommended Practice for Concrete Formwork.
- B. Submit compliance submittals as specified in Division 1, including but not limited to the following: bar schedule, bar details, shop drawings including size and location of openings, waterstops, and joint systems and curing method.
- C. Submit proposed concrete mix proportions to Engineer prior to placing concrete.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT:

- A. Type I, Type II or Type III, conforming to ASTM C150, as modified by Texas State Department of Highways and Public Transportation, 1982 Standard Specifications.

- B. Type I or II cement may be used unless Type II is specified.
- C. Except when Type II is specified, Type III may be used when the anticipated air temperature for the 12 hours following the placement of the concrete is not anticipated to exceed 60°F.
- D. Type III may be used in all pre-cast, pre-stressed concrete, except in piling when Type II cement is required for use as substructure concrete.
- E. All cement used in a monolithic placement shall be of the same type.
- F. Cements may be either bagged or bulk. Partially set or caked cement will be rejected.
- G. All types of cements shall be "low alkali" cements.

2.02 WATER:

- A. Water shall be clear, fresh, free from injurious amounts of oil, alkaline, acid or 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.
- B. Water of known potable quality requires no testing. Other sources shall meet the requirements of AASHTO T-26.
- C. Water shall have a pH of not less than 4.5 or more than 8.5.

2.03 FINE AGGREGATE:

- A. Natural sand, manufactured sand or a combination of the two, with or without mineral filler.
- B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.
- C. The maximum permissible percentage, by weight of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this

new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

D. Gradation, percent of weight retained:

<u>Sieve Size</u>	<u>Percent Retained</u>
3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	15 - 50
No. 30	35 - 75
No. 50	65 - 90
No. 100	90 - 100
No. 200	97 - 100

E. Fineness Modulus:

1. For Grade 1 only - 2.3 minimum, 3.1 maximum.

F. Mineral Filler:

1. May be added upon written authorization of Engineer
2. Shall be stone dust or clean crushed sand, or other approved inert material.
3. Shall not exceed 5% of the fine aggregate.
4. Shall meet the following requirements:
 - a. Passing No. 30 sieve 95 to 100%
 - b. Passing No. 100 sieve 70 to 100%

2.04 COURSE AGGREGATE:

- A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.
- B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.
- C. Crushed stone shall consist of the clean, dust free product resulting from the crushing of stone. There shall be no adherent coatings, clay, loam, organic or deleterious substances, salt or alkali, and other foreign material.
- D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.00%
Shale, Slate or other similar material	1.00%
Clay lumps	0.25%
Soft fragments	3.00%

Other deleterious substances, including friable, thin, elongated or laminated pieces 3.00%

The sum of all deleterious substances exclusive of material removed by decantation 5.00%

E. Coarse aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.

F. Gradation, percent of weight retained:

1. Grade No. 1 - Maximum Nominal Size 2 1/2-inches (63 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
2 1/2-inches	0
2-inches	0 - 20
1 1/2-inches	15 - 50
3/4-inches	60 - 80
No. 4	95 - 100

2. Grade No. 2 - Maximum Nominal Size 1 1/2-inches (37.5 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
2-inches	0
1 1/2-inches	0 - 5
3/4-inches	30 - 65
3/8-inches	70 - 90
No. 4	95 - 100

3. Grade No. 3 - Maximum Nominal Size 1-inch (25 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
1 1/2-inches	0 - 5
3/4-inches	10 - 40
1/2-inches	40 - 75
No. 4	95 - 100

4. Grade No. 4 - Maximum Nominal Size 3/8-inch (9.5 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
1/2-inches	0 - 5
3/8-inches	5 - 30
No. 4	75 - 100

G. Graduation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the

following conditions:

1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which concrete is to be placed.
2. Three-fourths (3/4) of the clear space between reinforcement.
3. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95 percent of the weight of the aggregate can be passed.
4. Unless otherwise noted or restricted by above, the Grade No. 2 gradation shall be used.

2.05 PIT-RUN AGGREGATE:

- A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.
- B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.
- C. Pit-run aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the following minimum requirements for percentages by weight:
 1. Retained on 1/4 in sieve 55 to 60%
- D. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and stronger.
- E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.06 ADMIXTURES:

- A. Concrete admixtures shall comply with Section 03320.

2.07 REINFORCING STEEL:

- A. Reinforcing steel shall comply with Section 03330.

2.08 CURING MATERIALS:

- A. Liquid Membrane: white pigmented chlorinated rubber, ASTM C309.
- B. Liquid Membrane: resin base, clear compound, permitting application of paint, Serviced Products Corporation - Code 2802 or equal.

- C. Plastic Film: White pigmented 0.00085-inches (minimum) thick.
- D. Burlap: jute fabric, lean, free of impurities.
- E. Surface Hardener: gray crystal, acidic fluosilicate base, slightly hygroscopic chemical surface hardener, SIKA Hardener, SIKA Chemical Corporation, or equal.

2.09 JOINT MATERIALS:

- A. Joint Sealer: hot poured, non-extruding, elastic, ASTM D1190.
- B. Preformed Expansion Joint Filler: non-extruding, bituminous fiber, ASTM D1751.

2.10 WATERSTOP:

- A. Polyvinyl chloride or rubber, centerbulb.
- B. Size to suit joinings, minimum 6-inches.

2.11 FORM MATERIALS:

- A. Use plywood, metal, metal framed plywood faced or other acceptable panel-type material.
- B. Coat forms with non-bonding, non-staining commercial compounds.

2.12 MOISTURE BARRIER:

- A. Polyethylene sheet, minimum 8-mil., ASTM E154.

2.13 CONCRETE MIX DESIGN AND CONTROL:

- A. Submit not less than 10 days prior to the start of concreting operations to the Engineer:
 - 1. Mix design, using a coarse aggregate factor acceptable to the Engineer.
 - 2. Sufficient samples of all materials to be incorporated into the mix for testing.
 - 3. Full description of the source of supply of each material component.
- B. Coarse aggregate factor:
 - 1. Not more than 0.82 when voids less than 48%.
 - 2. Not more than 0.85 when voids exceed 48%.
 - 3. Not less than 0.68.

- C. No changes or deviations from proportions or sources of supply without approval of Engineer.
- D. No concrete may be placed on the job site until the mix design has been approved by Engineer in writing to the Contractor.

2.14 CONCRETE QUALITY:

- A. Consistency:
 - 1. Mortar shall cling to the coarse aggregate.
 - 2. The aggregate shall not segregate during transport.
 - 3. The concrete and mortar shall show no free water when removed from the mixer.
- B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.
- C. The concrete shall be uniform, workable, and cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.
- D. Excessive bleeding shall be avoided.
- E. Slump requirements shall be as follows:

<u>Structural Concrete</u>	<u>Average Slump</u>	<u>Maximum Slump</u>
1. Cased Drilled Shafts and Thin-walled Sections (9-inches or less)	4	5
2. Slabs, Caps, Columns, Piers, wall sections over 9-inches, etc.	3	4
3. Slip Form Paving	1/2	2
4. Underwater or Seal Concrete	5	6
5. Rip-rap, Curb, Gutter and other Miscellaneous Surfaces	As Specified By Owner	As Specified By Owner

NOTE: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

- F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

Class Of Concrete	Minimum Maximum SX Cement Per CY	Minimum Comp. Strength 28-day PSI	Minimum Beam Strength 7-day psi ****	Maximum Water Cement Item 2.1.1 (c)(4)	Coarse Aggregate Number
A	5.0	3000	500	6.5	2-3-4
B	4.0	2000	330	8.0	2-3-4
C*	6.0	3600	600	6.0	1-2-3**
D	3.0	1500	250	11.0	2-3-4
E	6.0	3000	500	7.0	2-3
F	6.5	4200	700	5.5	2-3
H***	6.5 - 8.0	ASP	NA	5.5	3

ASP = As Specified on Plans.

*Entrained Air.

**No. 1 coarse aggregate may be used in foundations only (Except cased drilled shafts).

***Prestressed Concrete.

****ASTI C293 (Center Point).

2.15 GROUT:

A. Non-Shrink:

1. Use premixed non-shrink, Embeco Pre-Mixed Grout or Embeco Pre-Mixed Mortar by Master Builders Company or equal.
2. Keep water to a minimum for placing by the dry packing method.

PART 3 - EXECUTION

3.01 SUBGRADE:

- A. Insure subgrade is true to line and grade and compacted as specified.
- B. Fill and re-compact any ruts or depressions.
- C. Check cross section with a template.
- D. Place moisture barrier or moisten subgrade prior to placing of concrete. Method to be approved by Engineer.

3.02 FORMS:

- A. Provide forms for all concrete work, including footings and base slabs.

- B. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required.
- C. Forms shall be true, plumb and level with reasonably tight joints. Adequately support and brace forms.
- D. Place anchors, inserts, bolts, sleeves and other devices indicated or required for the various portions of all the work.
- E. Oil temporary forms with non-staining form oil before reinforcing steel is placed.
- F. Rough form finish as defined by ACI 301 permitted for concealed concrete.
- G. Smooth form finish as defined by ACI 301 permitted for concealed concrete.
- H. Provide 3/4 inch chamfer on exposed corners and edges, and 1-foot below ground level.

3.03 REMOVAL OF FORMS:

- A. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the superimposed loads.
- B. Remove formwork for columns, walls, beam sides and other parts not supporting the weight of the concrete as soon as the concrete has hardened sufficiently to resist damage from removal operations.
- C. Formwork for slabs, beam soffits and other parts supporting the weight of the concrete shall remain in place until the concrete has reached its specified 28-day strength.
- D. Protect concrete from damage prior to acceptance.
- E. Prohibit traffic until concrete is at least 10 days old.
- F. Cure areas previously covered by forms.

3.04 MIXING CONCRETE:

- A. Maintain all equipment, tools, and machinery used for hauling materials and performing any part of the work to insure completion of the work underway without excessive delays for repairs or replacement.
- B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.

- C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.
- D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.
- E. The entire contents of the drum shall be discharged before any materials are placed.
- F. Improperly mixed concrete will not be placed.
- G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.
- H. Transit Mix Concrete:
 - 1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
 - 2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
 - 3. Concrete shall not be placed on the job after a period of 1 hour after the cement has been placed in the mixer, with mixer turning; 30 minutes without turning.
- I. Continuous Volumetric Mix Concrete:
 - 1. A mobile, continuous, volumetric mixer of the rotating puddle type may be used for when approved by Engineer.
 - 2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mixed to the required consistency before discharging.
 - 3. The mixers shall have adequate water supply and metering devices.
 - 4. Calibration of these mixers will be required.

3.05 PLACING CONCRETE:

- A. The minimum temperature of all concrete at the time of placement shall not be less than 50°F.
- B. Clean transporting equipment, reinforcing and embedded items before placing concrete.
- C. Batch trucks or paving equipment not permitted on prepared subgrade unless authorized by the Engineer based on actual job conditions.

- D. Place no concrete until after inspection of forms by Engineer.
- E. 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:

Air or Concrete Temperature	Non-Agitated Concrete	Maximum Time
80°F or Above	26.6°C	15 minutes
35 to 79°F	1.6 to 26.1°C	30 minutes

Air or Concrete Temperature	Agitated Concrete	Maximum Time
90°F or Above	32.2°C	45 minutes
75 to 89°F	23.9 to 31.6°C	60 minutes
35 to 74°F	1.6 to 23.3°C	90 minutes

- F. Prevent segregation during placing.
- G. Consolidate flat work with one pass of mechanical vibrator moving parallel to centerline. Unusual section and widths may be hand puddled and finished.
- H. Place concrete continuously so that each pour unit will be monolithic in construction and will terminate at expansion, contraction or construction joint. Permit not more than 30 minutes between depositing adjacent batches.
- I. Place slab concrete over membrane before the waterproofing membrane becomes damaged or dirty.
- J. Concrete placement will not be permitted when impending weather conditions will impair the quality of the work.
- K. Slope horizontal surfaces of exterior concrete for drainage.
- L. Deposit concrete in forms in horizontal layers not deeper than 24 inches. Avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.
- M. Consolidate concrete by mechanical vibrating equipment supplemented by hand- spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- N. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate placed layer of concrete and at least 6-inches into preceding layer. Do not insert vibrators

into lower layers of concrete that have begun to set. Limit vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.06 PLACING CONCRETE IN WATER:

- A. Concrete shall be deposited in water only when specified on the plans or with written permission of the Engineer.
- B. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is deposited.
- C. Pump will not be permitted during the concrete placing, nor until it has set for at least 36 hours.
- D. The concrete shall be placed with a tremie, closed bottom-dump bucket or other approved method.
- E. The concrete shall not be allowed to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement.
- F. 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. The lower end of the tremie shall be submerged in the concrete at all times.
- G. 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.
- H. The placing operations shall be continuous until the work is complete.
- I. Unless otherwise specified, all concrete placed under water, except seal concrete, shall contain an additional sack of cement per cubic yard.

3.07 JOINTS:

- A. Type 'A' (Contraction) Joints:
 - 1. Extend entirely across flat slabs at locations shown.
 - 2. Where location is not shown, maximum spacing is:

- a. Driveways: 10-feet.
 - b. Sidewalks: 4-feet.
 - c. Other flat slabs: 20 times slab thickness.
3. Saw depth not less than 1/4 slab thickness.

B. Type 'B' (Isolation) Joint:

1. Install where shown on the plans.
2. Where location is not shown, place between all structures and features which project through, into or against slab.
3. Install according to manufacturer's recommendations. Set material securely before placing concrete.
4. Install 1/2-inch width unless shown otherwise.

C. Filling Joints:

1. Fill no later than 14 days after sawing.
2. Fill immediately following cleaning.
3. Fill to 1/8-inch of surface.
4. Remove excess while material is still pliable.
5. Refill low areas where necessary.
6. Omit filling sidewalk joints.

3.08 FINISHING EXTERIOR FLAT WORK:

- A. Strike off and float as required.
- B. Check surface with ten foot straight edge, maximum variance allowed is 1/8-inch.
- C. Drag concrete surface longitudinally with double thickness burlap drag after completion of straight edging unless noted otherwise.
- D. Use edger on edges of slab.
- E. Use hand finishing only when approved by Engineer.

3.09 FINISHING OTHER CONCRETE:

- A. Interior floors: smooth, steel-troweled finish. Use edger on exposed edges. Grind smooth defects which would telegraph through applied finish flooring.
- B. Exterior walks and steps: lightly broomed finish transverse to traffic flow. Use edger on exposed edges.
- C. Other surfaces:

1. Remove fins, projections and loose material.
2. Clean surfaces of form oil.
3. Patch honeycomb, aggregate pockets, voids and holes as follows:
 - a. Chip out until sound concrete is exposed to minimum depth of 1-inch.
 - b. Prepare patching mortar with approximately two parts of normal Portland Cement, one part white cement, nine parts fine aggregate; vary proportions of aggregate as necessary to match color of adjacent concrete.
4. Fill holes left by form ties to within 1 inch of surface with non-shrink grout. Fill remainder with patching mortar specified hereinbefore.
5. Apply grout-cleaned finish to all exposed vertical surfaces. Wet surface and rub grout on surfaces with rubber or cork float. Scrape off excess grout and finish with brick rubbing or as approved by Engineer.

D. Coordinate required finish with Engineer.

3.10 CURING:

- A. Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide proper equipment and in adequate amounts; and shall have approval of the proposed method, equipment and materials prior to placing concrete.
- B. All concrete shall be cured for a period of 4 days except as noted herein.
 1. Exceptions to 4-day Curing.
 - a. Upper surfaces of Bridge Roadways, Median and Sidewalk Slabs, and Top Slabs of Direct Traffic Culverts require 8 curing days.
 - b. A curing day is defined as a calendar day when the ambient temperature, taken in the shade away from artificial heat, is above 50° F(10°C) for at least 19 hours. If the ambient temperature is 50° F or less, a curing day is accepted only if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40° Fahrenheit (4.4°C) for the entire 24 hours.
- C. Form Curing:
 1. When forms are left in contact with the concrete, other curing methods shall not be required except for cold-weather protection.
- D. Water Curing:
 1. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet requirements for concrete mixing water.
 - a. Wet Mat:

- (1) Cotton mats shall be used for this curing method. The mats shall not be placed in contact with the concrete until such time that damage shall not occur to the surfaces.
 - (2) Damp burlap blankets made from 9-ounce stock may be placed upon the damp concrete surface for temporary protection prior to the application of the cotton mats.
 - (3) The mats may be placed by and wetted down after placement.
 - (4) Mat curing, except for continuous placements, shall commence not later than three hours after finishing of the roadway slab.
 - (5) The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible.
 - (6) The surfaces of the concrete shall be kept wet for the required curing time.
 - (7) Surfaces which cannot be cured by contact shall be enclosed with mats, 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:
- (1) This method shall be accomplished by overlapping sprays or sprinklers, so that all unformed surfaces are kept continuously wet.
- c. Ponding:
- (1) This method requires the covering of the surface with a minimum of two inches (5 cm) of clean granular material, kept wet at all times; or water to a minimum depth of one inch (2.5 cm). Satisfactory provisions shall be made to provide a dam to retain the granular material or water.

E. Membrane Curing

1. Unless otherwise shown on the plans, Type 2 membrane curing compound may be used where permitted.
2. A membrane shall be applied in a single, uniform coating at the rate of coverage recommended by the manufacturer and as approved by the Engineer, but not less than nine gallons per 210 feet (.0038M³ 63M) of area. Tests for acceptance shall be at this specified rate.
3. Membrane curing shall not be applied to dry surfaces; but shall be applied to horizontal surfaces just before free moisture has disappeared.
4. 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.

Structure Unit Description	REQUIRED		PERMITTED	
	Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for Interim Curing
Upper surfaces of bridge roadway;	X	X		

median *and* sidewalk
 slabs; top slabs of
 direct traffic culverts;
 top surface of any
 concrete unit upon
 which concrete is to be
 placed and bonded at
 a later interval (stub
 walls risers, etc.) Other
 super- structure
 concrete (curbs,
 wing-walls, parapet
 walls, etc.)

Resin Basin

Top surface of precast and/or prestressed piling	X	X
All substructure con- crete culverts box sewers inlets man- holes retaining walls riprap	X	X

*Polyethylene sheeting or burlap polyethylene mats fastened to prevent outside air from entering into the concrete shall be considered equivalent to water or membrane curing per this item.

5. 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.

3.11 TESTING:

- A. Furnish at least five cylinders or beams from each 50 cubic yard, or portion thereof for test purposes unless otherwise directed by Engineer. Test two cylinder at 7 days, test two cylinders at 28 days and test final cylinder only if needed for confirmation of compression strength.

3.12 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling-in: fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Use non-shrink grout as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Equipment bases and foundations: provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and

equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment. Use non-shrink grout as shown on plans.

- C. Steel pan stairs: provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screen, tamp and finish concrete surfaces as scheduled.
- D. Reinforced masonry: provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Cast-in-place concrete for the work shown on the plans shall be measured by the cubic yard as specified in the plans and contract.

4.02 PAYMENT:

- A. The accepted quantities of cast-in-place concrete shall be paid for at the unit bid price per cubic yard.
- B. The unit bid price shall be full compensation for furnishing, hauling, and mixing all concrete materials, including trial batches; placing curing and finishing all concrete; for all grouting and joints; furnishing and placing all expansion and construction joints, except as provided in the plans; furnishing and placing metal flashing strips and waterstops; and for all forms and false-work, labor tools, equipment and incidentals necessary to complete the work.
- C. The preceding provisions for payment shall not be interpreted to provide payment of concrete in railing, piling, precast, prestressed concrete units or other concrete items of which provision is otherwise made in the contract.

END OF SECTION

SECTION 03310 SUPPLIED CONCRETE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK COVERED:

- A. This work shall consist of furnishing, hauling, and mixing concrete materials.

1.02 QUALITY ASSURANCE:

- A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes. Applicable standards and codes include, but are not limited to, the following:
 - 1. ASTM C33 - Concrete Aggregates.
 - 2. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
 - 3. ASTM C94 - Ready-Mixed Concrete.
 - 4. ASTM C143 - Slump of Portland Cement Concrete.
 - 5. ASTM C150 - Portland Cement Concrete.
 - 6. ACI 301 - Specification for Structural Concrete for Building.
 - 7. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting.
- B. Submit proposed concrete mix proportions to Engineer prior to placing concrete.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT:

- A. Conforming to ASTM C150, as modified by Texas Department of Transportation, 1993 Standard Specifications.
- B. Cements may be either bagged or bulk. Partially set or caked cement will be rejected.
- C. All types of cements shall be "low alkali" cements.

2.02 WATER:

- A. Water shall be clear, fresh, free from injurious amounts of oil, alkaline, acid or 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.

B. Water of known potable quality requires no testing. Other sources shall meet the requirements of AASHTO T-26.

C. Water shall have a pH of not less than 4.5 or more than 8.5.

2.03 FINE AGGREGATE:

A. Natural sand, manufactured sand or a combination of the two, with or without mineral filler.

B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.

C. The maximum permissible percentage, by weight of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

D. Gradation, percent of weight retained:

<u>Sieve Size</u>	<u>Percent Retained</u>
3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	15 - 50
No. 30	35 - 75
No. 50	65 - 90
No. 100	90 - 100
No. 200	97 - 100

E. Fineness Modulus:

1. For Grade 1 only - 2.3 minimum, 3.1 maximum.

F. Mineral Filler:

1. May be added upon written authorization of Engineer.

2. Shall be stone dust or clean crushed sand, or other approved inert material.
3. Shall not exceed 5% of the fine aggregate.
4. Shall meet the following requirements:
 - a. Passing No. 30 sieve 95 to 100%
 - b. Passing No. 100 sieve 70 to 100%

2.04 COARSE AGGREGATE:

- A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.
- B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.
- C. Crushed stone shall consist of the clean, dust free product resulting from the crushing of stone. There shall be no adherent coatings, clay, loam, organic or deleterious substances, salt or alkali, and other foreign material.
- D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.00%
Shale, Slate or other similar material	1.00%
Clay lumps	0.25%
Soft fragments	3.00%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.00%
The sum of all deleterious substances exclusive of material removed by decantation	5.00%

- E. Coarse aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.
- F. Gradation, percent of weight retained:

1. Grade No. 1 - Maximum Nominal Size 2 1/2-inches (63 mm)

Sieve	Percentage Retained
2 1/2-inches	0
2-inches	0 - 20
1 1/2-inches	15 - 50
3/4-inches	60 - 80
No. 4	95 - 100

2. Grade No. 2 - Maximum Nominal Size 1 1/2-inches (37.5 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
2-inches	0
1 1/2-inches	0 - 5
3/4-inches	30 - 65
3/8-inches	70 - 90
No. 4	95 - 100

3. Grade No. 3 - Maximum Nominal Size 1-inch (25 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
1 1/2-inches	0 - 5
3/4-inches	10 - 40
1/2-inches	40 - 75
No. 4	95 - 100

4. Grade No. 4 - Maximum Nominal Size 3/8-inch (9.5 mm)

<u>Sieve</u>	<u>Percentage Retained</u>
1/2-inches	0 - 5
3/8-inches	5 - 30
No. 4	75 - 100

G. Gradation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the following conditions:

1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which concrete is to be placed.
2. Three-fourths (3/4) of the clear space between reinforcement.
3. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95 percent of the weight of the aggregate can be passed.
4. Unless otherwise noted or restricted by above, the Grade No. 2 gradation shall be used.

2.05 PIT-RUN AGGREGATE:

- A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.
- B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.

C. Pit-run aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the following minimum requirements for percentages by weight:

1. Retained on 1/4 in sieve 55 to 60%

D. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and stronger.

E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.06 ADMIXTURES:

A. Concrete admixtures shall comply with Section 03320.

2.07 CONCRETE MIX DESIGN AND CONTROL:

A. Submit not less than 10 days prior to the start of concreting operations to the Engineer:

1. Mix design, using a coarse aggregate factor acceptable to the Engineer.
2. Sufficient samples of all materials to be incorporated into the mix for testing.
3. Full description of the source of supply of each material component.

B. Coarse aggregate factor:

1. Not more than 0.82 when voids less than 48%.
2. Not more than 0.85 when voids exceed 48%.
3. Not less than 0.68.

C. No changes or deviations from proportions or sources of supply without approval of Engineer.

D. No concrete may be placed on the job site until the mix design has been approved by Engineer in writing to the Contractor.

2.08 CONCRETE QUALITY:

A. Consistency:

1. Mortar shall cling to the coarse aggregate.
2. The aggregate shall not segregate during transport.
3. The concrete and mortar shall show no free water when removed from the mixer.

- B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.
- C. The concrete shall be uniform, workable, and cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.
- D. Excessive bleeding shall be avoided.
- E. Slump requirements shall be as follows:

<u>Structural Concrete</u>	<u>Average Slump</u>	<u>Maximum* Slump</u>
1. Cased Drilled Shafts and Thin-Walled Sections (9-inches or less)	4	5
2. Slabs, Caps, Columns, Piers wall sections over 9-inches, etc.	3	4
3. Slip Form Paving	1/2	2
4. Underwater or Seal Concrete	5	6
5. Sidewalks	4	5
6. Rip-rap, Curb, Gutter and other Miscellaneous Surfaces	As Specified By Owner	As Specified By Owner

* NOTE: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

- F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

Class Of Concrete	Minimum-Maximum SX Cement Per CY	Minimum Comp. Strength 28-day PSI	Minimum Beam Strength 7-day psi ****	Maximum Water Cement Item 2.1.1 (c)(4)	Coarse Aggregate Number
A	5.0	3000	500	6.5	2-3-4
B	4.0	2000	330	8.0	2-3-4
C*	6.0	3600	600	6.0	1-2-3**
D	3.0	1500	250	11.0	2-3-4
E	6.0	3000	500	7.0	2-3
F	6.5	4200	700	5.5	2-3
H***	6.5 - 8.0	ASP	NA	5.5	3

ASP = As Specified on Plans.

*Entrained Air.

**No. 1 coarse aggregate may be used in foundations only (Except cased drilled shafts).

***Prestressed Concrete.

****ASTI C293 (Center Point).

PART 3 - EXECUTION

3.01 MIXING CONCRETE:

- A. Maintain all equipment, tools, and machinery needed for timely production and delivery of concrete to jib site.
- B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.
- C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.
- D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.
- E. The entire contents of the drum shall be discharged before any materials are placed.
- F. Improperly mixed concrete will not be placed.
- G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.
- H. Transit Mix Concrete:
 - 1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
 - 2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
 - 3. Concrete shall not be placed on the job after a period of 1 hour after the cement has been placed in the mixer, with mixer turning; 30 minutes without turning.
 - 4. All delivery trucks shall have batch tickets that clearly indicate the name of the supplier, the time the concrete was batched, the truck number, the design strength, the amount of concrete delivered in cubic yards, the amount of cement, the amount of water added at the batch plant and at the site, and the amount and type of any admixtures added to the mix.

I. Continuous Volumetric Mix Concrete:

1. A mobile, continuous, volumetric mixer of the rotating puddle type may be used for when approved by Engineer.
2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mixed to the required consistency before discharging.
3. The mixers shall have adequate water supply and metering devices.
4. Calibration of these mixers will be required.

3.02 TESTING:

- A. If directed by the Engineer, a trial batch shall be mixed for the purpose of testing the design mix. A total of two sets of four cylinders shall be obtained in accordance with ASTM C 31-95 from two separate samples of the trial batch for compressive strength tests in accordance with ASTM C 39-86. One cylinder from each set will be tested at 3 days and 7 days. The remaining two cylinders shall be tested at 28 days. The Engineer may also elect to have two sets of two beams constructed for flexural strength testing at 28 days in accordance with ASTM C 78-94.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Concrete supplied for work shown on approved plans shall be measured by the cubic yard.
- B. A delivery ticket indicating the name of the supplier, the time the concrete was batched, the truck number, the design strength, the amount of concrete delivered in cubic yards, the amount of cement, the amount of water added at the batch plant and at the site, and the amount and type of any admixtures added to the mix, shall be provided to the Engineer for all deliveries.

4.02 PAYMENT:

- A. The accepted quantities of supplied concrete shall be paid for at the unit bid price per cubic yard.
- B. The unit bid price shall be full compensation for furnishing and mixing all concrete materials, including trial batches and delivery.

END OF SECTION

SECTION 03320 CONCRETE ADMIXTURES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This work shall consist of furnishing materials for use as admixtures in concrete.

PART 2 - PRODUCTS

2.01 AIR ENTRAINING ADMIXTURE:

- A. An "Air Entraining Admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will entrain uniformly dispersed microscopic air.
- B. This admixture shall conform to ASTM C 260, 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 a mill.
 - 2. Unless otherwise indicated, the minimum relative durability factor shall be 80.
- C. The air entraining admixture used in the reference concrete shall be high quality neutralized Vinsol Resin.

2.02 WATER – REDUCING, RETARDING ADMIXTURE:

- A. 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 retard the initial set of the concrete.
- B. This mixture shall conform to ASTM C 494, Type A or D, modified as follows:
 - 1. The water-reducing retarder shall retard the initial set of the plastic concrete a minimum of 2 hours and a maximum of 4 hours when the materials are at a temperature of 90 F, the dosage rate specified by the manufacturer.
 - 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. All concrete tested shall contain entrained air.

2.03 WATER – REDUCING ADMIXTURE:

- A. 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 and required strength.

- B. This admixture shall conform to ASTM C 494, Type A.

2.04 ACCERLERATING ADMIXTURE:

- A. An “Accelerating Admixture” is defined as an admixture that accelerates the setting time and the early strength development of concrete.
- B. This admixture shall conform to ASTM C 494, Type C, modified as follows:
 - 1. The accelerating admixture will contain no chlorides and shall be used in the liquid form only.

2.05 HIGH – RANGE WATER REDUCING ADMIXTURES:

- A. High-range Water Reducing Admixture,” referred to as a superplastersize, is defined as a synthetic polymer material which, when added to a low slump concrete mixture increases the slump without segregation, impermeability and durability of the mix.
- B. This admixture shall conform to ASTM C 494, Type F or G, modified as follows:
 - 1. It shall reduce the required water by a minimum of 15 percent.
 - 2. It shall increase the 7 day compressive strength of the concrete by a minimum of 25 percent.
- C. The admixture when added to the mix shall produce the following:
 - 1. Modify a low slump concrete, without the addition of water, to produce a slump which conforms to the range indicated.
 - 2. It shall prevent a temperature rise of the mix above 100 F during high ambient conditions.
 - 3. It shall not increase the chloride content of the mix.

2.06 CERTIFICATION:

- A. The CONTRACTOR shall submit the name of the admixture proposed and manufacturer’s certification that products selected meet the requirements of this item and of ADTM C 260 and C 494 as required.
- B. If more than one admixture is proposed in the concrete mix, a statement of compatibility of components shall accompany certification.

- C. The ENGINEER may request additional information to be submitted such as infrared spectrophotometry scan, solids content, ph value, etc., for further identification.
- D. A change in formulation discovered by any of the tests prescribed herein or other means and not reported and retested, may be cause to permanently bar the manufacturer from furnishing admixtures for City of Edinburg work.
- E. The ENGINEER reserves the right to perform any or all of the tests required by ASTM C 260 and C 494 as a check on the tests reported by the manufacturer.
- F. In case of any variance, the ENGINEER tests will govern.

2.07 APPROVAL:

- A. The ENGINEER shall approve all admixtures and dosage. Approval of admixtures shall be based on previous performance of the admixture.
- B. The dosage will be determined from the manufacturer's recommendations, trial mixes or current job approved mix designs, if it is shown that no substantial change in any of the proposed ingredients has been made.
- C. Should the CONTRACTOR desire to change the admixture or dosage approved during the progress of the work, the CONTRACTOR shall perform trial mixes at his own expense and submit the new mix design for approval.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS:

- A. No concrete shall be delivered to the project until the mix design is approved. All concrete delivered shall conform to the approved job mix formula. Unless otherwise indicated, all concrete shall be air entrained. All admixtures will be added at the Batch Plant. All admixtures shall be in the liquid state. No admixtures shall be dispensed on dry aggregates. Each admixture shall be dispensed separately, but at the same time as the mixing water.
- B. An approved job mix formula for normal hot weather concreting may not perform satisfactory for extended retardation, in which case its use will not be permitted.
- C. The rotation of the mixer shall be sufficient to thoroughly mix the admixture into the concrete.
- D. Admixtures shall be agitated as required to prevent separation or sedimentation of solids. Air agitation of Neutralized Vinsol Resin will not be permitted.

- E. Normally Air entraining agents shall be charged into the mixer at the beginning of the batch and retarding or water reducing admixtures shall be charged into the mixer during the last part (approximately 1/3) of the batch when an air-entraining agent is used.
- F. Accelerating admixtures will be used only on the written approval of the ENGINEER. Accelerating admixtures will not be permitted in bridge decks, direct traffic culvert slabs at any time nor when Type II cement is specified.
- G. All admixtures shall be of the same brand from only one manufacturer for the entire project, unless otherwise approved by the ENGINEER.
- H Accelerators will be used only to meet special project requirements and will require the approval of the ENGINEER.
- I For individual placements of concrete of 25 cubic yards or more and for all ready-mix concrete, the admixture shall be measured and dispensed by a readily adjustable dispenser. When set to a predetermined volume, the dispenser shall fill to the preset amount and hold it positively without leakage until the operator releases the content into the mixing water by some positive means. Unless otherwise indicated, completely automatic dispensing will not be required, except for use with a fully automatic plant.
- J The calibrated container shall be a measuring reservoir of the type where the level of the admixture is visible at all times. A strip gauge with one ounce increments for air entraining admixtures, ten ounce increments for dispersing admixtures, shall be attached securely to the measuring apparatus. This strip shall be a material possessing weather resistant qualities. The accuracy equipment shall visibly show the total amount to be dispensed for ready check by the ENGINEER.
- K When individual placements of less than 25 cubic yards and with the concrete batched on the job site, the ENGINEER may waive the requirements for mechanical dispensing equipment.
- L When high-range water reducing admixtures are indicated the following will be observed:
 - 1. Ready-mix concrete shall be delivered in transit mixers and the capacity of the transit mixer shall be reduced for each batch by 25 percent of the rated capacity to assure proper mixing.
 - 2. If during the placement of concrete, a change in slump resulting in a slump loss in excess of 3 inches is noted, the remaining concrete shall be rejected.
 - 3. The addition of water will not be permitted at the job site.

4. Only one liquid admixture shall be used to achieve the desired results, except where air entrainment is indicated, the air entrainment agent will be permitted.
5. The concrete design shall meet the following requirements:

<u>Item</u>	<u>Test</u>	<u>Value</u>
Air entrainment	ASTM C 260	3 to 6 percent
High range water Reducing admixture	ASTM C 494 Type F or G	
Water cement ratio Gal/Sack Max.		6.25
Minimum cement content In Sacks (94 lb. Sack)		6.0
Coarse aggregate factor		6.5
Slump Maximum, inches		10
Flexural strength @ 7 days, psi		650
Maximum concrete Temperature, F		100

PART 4 - MEASUREMENT AND PAYMENT

- 4.01** No additional compensation will be made for the materials, equipment tests or methods required by this item, but shall be considered subsidiary to various items included in the contract.

END OF SECTION

SECTION 03330 REINFORCING STEEL

PART 1 - GENERAL

1.01 SCOPE:

This work shall consist of the furnishing and placing of reinforcing steel, deformed and smooth, of the size and quantity indicated and in accordance with these specifications.

PART 2 - PRODUCTS

2.01 BARS

- A. Bar reinforcement shall be deformed and shall conform to ASTM A 615, A 616, Grades 40, 60 or 75 and shall be open-hearth, basic oxygen or electric furnace new billet steel, unless otherwise indicated. Large diameter new billet steel (Nos. 14 and 18), Grade 75, and will be permitted for straight bars only.
- B. Where bending of bar sizes No. 14 or No. 18 of Grades 40 or 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 at a minimum temperature of 60 F around a pin having a diameter of 10 times the nominal diameter of the bar and shall be free of cracking.
- C. Spiral reinforcement shall be either smooth or deformed bars or wire of the minimum diameter indicated. Bars for spiral reinforcement shall comply with ASTM A 675, A 615 or A 617. Wire shall comply with ASTM A 82. The minimum yield strength for spiral reinforcement shall be 40,000 psi.
- D. In cases where the provisions of this item are in conflict with the provisions of the ASTM Designation to which reference is made, the provisions of this item shall govern.
- E. Report of chemical analysis showing the percentages of carbon, manganese, phosphorus and sulfur will be required for all reinforcing steel when it is to be welded, except for drill shafts. No tack welding will be allowed. All welding shall conform to the requirements of AWS D-1-72.
- F. The nominal size and area and the theoretical weight (lbs) of reinforcing steel bars covered by these specifications are as follows:

BAR SIZE NUMBER	NOMINAL DIAMETER (INCHES)	NOMINAL AREA (SQ INCHES)	WEIGHT PER LINEAR FOOT (POUNDS)
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	7.65
18	2.257	4.00	13.60

- G. Smooth bars, larger than No. 4, may be steel conforming to the above or may be furnished in any steel that meets the physical requirements of ASTM A36.
- H. Smooth, round bars shall be designated by size number through No. 4. Smooth bars above No. 4 shall be designated by diameter in inches.

2.03 WELDED WIRE FABRIC

- A. Wire for fabric reinforcement shall be cold-drawn from rods hot-rolled from open-hearth, basic oxygen or electric furnace billet. Wire shall conform to the requirements of the standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement, ASTM A82 or A 496. Wire fabric, when used as reinforcement, shall conform to ASTM A 185 or A 497.
- B. When wire is ordered by size numbers, the following relations between size number, diameter in inches and area shall apply unless otherwise indicated:

SIZE W NUMBER	NOMINAL DIAMETER (INCH)	NOMINAL AREA (SQ INCHES)
31	0.628	0.310
30	0.618	0.300
28	0.597	0.280
26	0.575	0.260
24	0.553	0.240
22	0.529	0.220
20	0.505	0.200
18	0.479	0.180
16	0.451	0.160
14	0.391	0.140
12	0.391	0.120

10 SIZE W NUMBER	0.357 NOMINAL DIAMETER (INCH)	0.100 NOMINAL AREA (SQ INCHES)
8	0.319	0.080
7	0.299	0.070
6	0.276	0.060
5.5	0.265	0.055
5	0.252	0.050
4.5	0.239	0.045
4	0.226	0.040
3.5	0.211	0.035
3	0.195	0.030
2.5	0.178	0.025
2	0.160	0.020
1.5	0.138	0.015
1.2	0.124	0.012
1	0.113	0.010
0.5	0.080	0.005

C. When deformed wire is required, the size number shall be preceded by D and for smooth wire the prefix W shall be shown.

2.04 CHAIRS AND SUPPORTS

A. Chairs and Supports shall be steel, precast mortar or concrete block cast in molds meeting the approval of the ENGINEER of sufficient strength to position the reinforcement as indicated when supporting the dead load of the reinforcement, the weight of the workers placing concrete and the weight of the concrete bearing on the steel.

B. Chairs shall be plastic coated when indicated.

C. Chair types and uses shall be as follows:

Structural or Architectural Elements (columns, beams, walls, slabs) feet.	Galvanized steel or steel chairs with plastic coated
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exposed to weather, not subjected to
sand blasting, water blasting or grinding.

Structural or Architectural Elements exposed to weather and subject to sand blasting, water blasting or grinding.	Stainless steel chairs.
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Structural or Architectural Elements exposed to weather or corrosive conditions.	Uncoated steel chairs.
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Slabs and grade beams cast on grade. Steel chairs with a base with 9 inch² minimum area or sufficient area to prevent the chair from sinking into fill or subgrade. Precast mortar or concrete blocks meeting the requirements of this item may be used.

2.05 BENDING

- A. The reinforcement shall be bent cold, true to the shapes indicated. Bending shall preferably be done in the shop.
- B. Irregularities in bending shall be cause for rejection.
- C. Unless otherwise indicated, the inside diameter of bar bends, in terms of the nominal bar diameter (d), shall be as follows:
 - 1. Bends of 90 degrees and greater in stirrups, ties and other secondary bars that enclose another bar in the bend:

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 50</u>
3, 4, 5	3d	4d
6, 7, 8	4d	5d

- 2. All bends in main bars and in secondary bars not covered above:

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 60</u>	<u>Grade 75</u>
3 - 8	6d	6d	--
9, 10	8d	8d	--
11	8d	8d	8d
14, 18	10d	10d	--

2.06 STORAGE

- A. 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.
- B. 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.
- C. 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 brushed specimen meets the physical requirements for the size and grade of steel indicated.

2.07 SPLICES

- A. No splicing of bars, except when indicated or specified herein, will be permitted without written approval of the ENGINEER.
- B. No substitution of bars will be allowed without the approval of the ENGINEER. Any splicing of substituted bars shall conform to Table 03330-1.
- C. Splices not indicated will be permitted in slabs no more than 15 inches in thickness, columns, walls and parapets, but not included for measurement, subject to the following:
 - 1. Splices will not be permitted in bars 30 feet or less in plan length.
 - 2. For bars exceeding 30 feet in plan length, the distance center to center of splices shall not be less than 30 feet minus 1 splice length, with no more than 1 individual bar length less than 10 feet.
 - 3. Splices not indicated, but permitted hereby, shall conform to Table 03330-1. The specified concrete cover shall be maintained at such splices and the bars placed in contact and securely tied together.

Table 03330-1
Minimum Lap Requirements

<u>Bar Number</u>	<u>Grade 40</u>	<u>Grade 60</u>
3	1 foot 0 inches	1 foot 0 inches
4	1 foot 2 inches	1 foot 9 inches
5	1 foot 5 inches	2 feet 2 inches
6	1 foot 9 inches	2 feet 7 inches
7	2 feet 4 inches	3 feet 5 inches
8	3 feet 0 inches	4 feet 6 inches
9	3 feet 10 inches	5 feet 6 inches
10	4 feet 10 inches	7 feet 3 inches
11	5 feet 11 inches	8 feet 11 inches

- D. Spiral steel shall be lapped a minimum of 1 turn. Bar No. 14 and No. 18 may not be lapped.
- E. Welding of reinforcing bars may be used only where indicated or as permitted herein. All welding operations, processes, equipment, materials, workmanship and inspection shall conform to the requirements indicated. All splices shall be of such dimension and character as to develop the full strength of the bar being spliced.
- F. End preparation for butt welding reinforcing bars shall be done in the field, except Bar No. 6 and larger shall be done in the shop. Delivered bars shall be of sufficient length to permit this practice.
- G. For box culvert extensions with less than 1 foot of fill, the existing longitudinal

bars shall have a lap with the new bars as shown in Table 03330-1.

- H. For box extensions with more than 1 foot of fill, a minimum lap of 6 inches will be required.
- I. Unless otherwise indicated, dowel bars transferring tensile stress shall have a minimum embedment equal to the minimum lap requirements shown in Table 03330-1.
- J. Shear transfer dowels shall have a minimum embedment of 12 inches.

PART 3 - EXECUTION

3.01 PLACING

- A. Reinforcement shall be placed as near as possible in the position indicated. Unless otherwise indicated, dimensions shown for reinforcement are to the center of the bars.
- B. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 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 1/4 inch.
- C. Cover of concrete to the nearest surface of steel shall be as follows:

<u>Item</u>	<u>Min. Cover (Inches)</u>
1. Concrete cast against and permanently exposed to earth.	3
2. Concrete exposed to earth or weather: Bar No. 6 through 18 bars	2
Bar No. 5, W31 or D31 wire and smaller	1-1/2
3. Concrete not exposed to weather or in contact with ground:	
(slabs, walls, joists)	
Bar No. 14 and 18	1-1/2
Bar No. 11 and smaller	1
(Beams, columns)	
Primary reinforcement, ties, stirrups, spirals (Shells, folded plate members)	1-1/2
Bar No. 6 and larger	1
Bar No. 5, W31 or D31 wire, and smaller	1

- D. 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 precast mortar or concrete blocks. For approval of plastic spacers on a 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.
- E. All reinforcing steel shall be tied at all intersections, except that where spacing is less than 1 foot in each direction, alternate intersections only need be tied. For reinforcing steel cages for other structural members, the steel shall be tied at enough intersections to provide a rigid cage of steel. Mats of wire fabric shall overlap each other 1 full space as a minimum to maintain a uniform strength and shall be tied at the ends and edges.
- F. Where prefabricated deformed wire mats are specified or if the CONTRACTOR requests, welded wire fabric may be substituted for a comparable area of steel reinforcing bar plan, subject to the approval of the ENGINEER.
- G. 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 authorized by the ENGINEER, the size of the surface to be placed adjacent to the forms shall not exceed 2 1/2 inches square or the equivalent thereof in cases where circular or rectangular areas are provided. Blocks shall be cast accurately the thickness required and the surface to be placed adjacent to the forms shall be a true plan, free of surface imperfections.
- H. Reinforcement shall be supported and tied in such a manner that sufficiently rigid cage 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 above.
- I. No concrete shall be deposited until the ENGINEER has reviewed the placement of the reinforcing steel and all mortar, mud, dirt, etc., shall be cleaned from the reinforcement, forms, workers' boots and tools.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This item shall be incidental to the construction of particular items and shall be

measured as noted on the plans and specifications for the item being constructed.

- B. Measurement required by a change in design shall be computed as described above for the actual steel required to complete the work of a particular construction component.

4.02 PAYMENT

- A. The accepted quantities of reinforcing steel will be paid for at the contract unit bid price subsidiary to the constructed item and shall be included within the price bid of the construction item.
- B. When not listed as a separate contract pay item, reinforcing steel shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
- C. Compensation, whether by contract pay item or incidental work, will be for furnishing, bending, fabricating, welding and placing reinforcement, for all clips, blocks, metal spacers, ties, chairs, wire or other materials used for fastening reinforcement in place and for all tools, labor, equipment and incidentals necessary to complete the work.

END OF SECTION

SECTION 09101 CONSTRUCTION TRAFFIC CONTROL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

- A. This item shall consist of the construction, manipulation, maintenance and removal, if required, of detours of the length and to the lines, grades, and typical sections indicated and providing for installing, moving, replacing, maintaining, cleaning and removing upon completion of the work, as required, all detour markers, signs, barricades and other devices used in traffic control and handling at the construction site as indicated or as directed by the ENGINEER.
- B. CONTRACTOR shall be responsible for submittal of a traffic control plan sealed by a registered professional engineer in the state of Texas prior to the start of construction. CONTRACTOR shall be responsible for all traffic control measures and implementation. All proposed routing of traffic must be approved in writing prior to implementation. All traffic control devices shall be in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD), latest edition.
- C. This item shall also consist of providing, installing, moving, replacing, maintaining, cleaning and removing temporary or permanent street closure barricades, signs or other devices required to handle the traffic in conformance with the current edition of the Texas Manual of Uniform Traffic Control Devices for Street and Highways and as indicated or directed by the ENGINEER.
- D. Implementation. Before beginning work, designate in writing a Contractor's Responsible Person (CRP) to be the representative of the Contractor who is responsible for taking or directing corrective measures of installation and maintenance deficiencies as soon as possible. The CRP must be accessible by phone and able to respond to emergencies 24 hours per day.
- E. Follow the Traffic Control Plan (TCP) and install traffic control devices as shown on the plans and as directed. Install traffic control devices straight and plumb. Do not make changes to the location of any device or implement any other changes to the TCP without the approval of the Engineer. Minor adjustments to meet field constructability and visibility are allowed.
- F. Submit Contractor-proposed TCP changes, signed and sealed by a licensed professional engineer, to the Engineer for approval. The Engineer may develop, sign, and seal Contractor-proposed changes. Changes must conform to guidelines established in the TMUTCD using approved products from the Texas DOT Compliant Work Zone Traffic Control Device List (CWZTCDL).

- G. Maintain traffic control devices by taking corrective action as soon as possible. Corrective action includes but is not limited to cleaning, replacing, straightening, covering, or removing devices. Maintain the devices such that they are properly positioned, spaced, and legible, and that reflective characteristics meet requirements during darkness and rain.
- H. Flaggers. Provide a Contractor representative who has been certified as a flagging instructor through courses offered by the Texas Engineering Extension Service, the American Traffic Safety Services Association, the National Safety Council, or other approved organizations. Provide the certificate indicating course completion when requested. This representative is responsible for training and assuring that all flaggers are qualified to perform flagging duties. A qualified flagger must be independently certified by one of the organizations listed above or trained by the Contractor's certified flagging instructor. Provide the Engineer with a current list of qualified flaggers before beginning flagging activities. Use only flaggers on the qualified list. Flaggers must be courteous and able to effectively communicate with the public. When directing traffic, flaggers must use standard attire, flags, signs, and signals and follow the flagging procedures set forth in the TMUTCD.
- I. Removal. Upon completion of work, remove all barricades, signs, cones, lights, and other traffic control devices used for work-zone traffic handling, unless otherwise shown on the plans.

PART 2 - PRODUCTS

2.01 CONSTRUCTION TRAFFIC CONTROL SIGNS:

- A. Construction traffic control signs shall conform to the State of Texas DOT Manual of Uniform Traffic Control Devices, Parts 5 & 6 unless otherwise directed by the ENGINEER.
- B. The substrate for construction signs need only be sufficiently durable to last the life of the project and sufficiently rigid to hold the sheeting in a flat plane.

2.02 SIGN SUPPORTS:

- A. Supports for construction traffic control signs shall be grade #2 fir or yellow pine, pressure treated with pentachlorophenol.
- B. Supports shall have a minimum nominal size of 4-inches x 4-inches and conform to the details shown on the plans.

2.03 PORTABLE SIGN SUPPORT:

- A. Materials for portable sign supports shall comply with the details shown on the plans. Portable sign supports other than those shown on the plans shall be submitted to the ENGINEER for approval prior to use.

2.04 BARRICADES:

- A. Barricades shall be classified as Type I, Type II, or Type III and shall comply with the details shown on the plans and the TMUTCD.
- B. Barricade rails shall be fabricated using grade #2 fir or yellow pine and reflectorized sheeting conforming to the requirements shown in Section 2.08(5).

2.05 VERTICAL PANELS:

- A. Materials for vertical panels shall conform to the details shown on the plans. Vertical panels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements of the TMUTCD and Table 9000-3.

2.06 CONSTRUCTION TRAFFIC MARKINGS:

- A. Construction traffic markings shall comply with Section 9101 and the details shown in the plans.

2.07 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION:

- A. The pavement-marking material shall consist of an adhesive-backed reflective tape that can be applied to the pavement. Markings shall be of good appearance, have straight, unbroken edges and have a color that complies with all federal regulations.
 - 1. Color
 - a) The markings, as well as retroreflected light from the markings, shall be white or yellow as indicated.
 - 2. Visibility
 - a) The pavement markings (during daylight hours) shall be distinctively visible for a minimum of 300 feet unless sight distance is restricted by geometric roadway features.
 - b) The pavement markings (when illuminated by automobile low beam headlights at night) shall be distinctly visible for a minimum of 160 feet unless sight distance is restricted by geometric features.
 - c) The above day and night visibility requirements shall be met when viewed from an automobile traveling on the roadway.

2.08 CHANNELIZATION DEVICES:

- A. Barrels

1. Barrels shall be of metal or nonmetal composition approved by the ENGINEER and of 30 to 55 gallon capacity. Only one size may be used on the project. The barrels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements of TMUTCD. The markings on the barrels shall be horizontal, circumferential, orange, and wide. There shall be a minimum of 5 alternating orange and white stripes on each barrel. Barrels shall also conform to the details shown on the plans.
2. Type "B" barrels shall be equipped with either Type "A" low intensity or Type "C" steady-burn warning lights complying with the provisions to TMUTCD and the Institute of Transportation Engineers (ITE) standard for flashing and steady-burn lights. The use of warning lights shall be as directed by the ENGINEER.

B. Traffic Cones

1. Traffic cones shall conform to the details shown on the plans.

C. Tubular Traffic Markers

1. Post
 - a) The post shall be of a thermoplastic or pliable elastomeric composition meeting the manufacturer's requirements.
 - b) Properties:
 - Outside Diameter.....2.23 inches to 4 inches
 - Wall Thickness.....0.125 inches min.
 - Length.....18 to 36 inches
 - Color.....Orange
2. Base
 - a) The base shall be of a thermoplastic or pliable elastomeric composition meeting the manufacturer's requirements.
 - b) Properties:
 - Height:.....1/2 to 2 inches
 - Outside Diameter:... 7 to 12 inches
 - Color:black or same color as post
3. Assembly Units
 - a) Assembly units which are inherent with the particular marker shall be as per manufacturer's recommendations.
4. Adhesives
 - a) Adhesive shall be epoxy type (temporary installation, permanent installation or butyl type) as per manufacturer's recommendations.
 - b) Other methods approved by the ENGINEER prior to initiating the work may be used; however, said approval does not abrogate the CONTRACTOR'S responsibility of effecting the temporary or permanent installation.

5. Reflectorization

- a) If used at night, tubular traffic markers shall have two 3-inch, circumferential reflective bands, no more than 2-inches from the top with no more than 6-inches separating the bands. Reflective material shall be SIA-250 or higher sheeting conforming to the provisions of Section 9000. The color of reflective material shall be as shown in the plans.

2.09 SEQUENTIAL ARROW DISPLAYS

- A. Sequential arrow displays shall be sequentially lighted and roof or trailer mounted. The minimum panel size shall be 30-inches high and 54-inches wide. The display shall have 22 hooded sealed beam amber lamps rated at a maximum intensity of 8800 candlepower.
- B. Light intensity shall be adjustable by dimmer switch. The operating modes shall be as follows:
 1. Pass Left. 3 chevrons of 5 lamps each sequence in right to left pattern, 40 to 50 times per minute.
 2. Pass Right. 3 chevrons of 5 lamps each sequence in left to right pattern, 40 to 50 times per minute.
 3. Pass Either Side. The two outermost chevrons on each end of the panel pointing like arrowheads and flashing 40 to 50 times per minute with crossing row of lamps burning continuously.
 4. Warning. 4 lamps, one at each corner of the panel, flashing 40 to 50 times per minute.

2.10 MATERIALS FOR CONSTRUCTION DETOURS

- A. Flexible Base
 1. Flexible base shall conform to Section 02601.
- B. Prime Coat
 1. Prime Coat shall conform to Section 02610.
- C. Seal Coat
 1. Seal Coat shall conform to Section 02617.
- D. Hot Mix Asphaltic Concrete Pavement
 1. Hot Mix shall be Type D conforming to Section 02612.
- E. Seeding
 1. Seeding shall conform to Section 02936.

PART 3 - EXECUTION

3.01 CONSTRUCTION TRAFFIC CONTROL SIGNS AND SIGN SUPPORTS:

- A. Construction traffic control signs and sign supports shall be installed at locations noted on the plans in conformance with the TMUTCD or as directed by the ENGINEER.

3.02 PORTABLE SIGN SUPPORTS:

- A. Portable sign supports for traffic control devices for detours shall be furnished by the CONTRACTOR or shall be installed at the locations shown on the plans, and shall remain the property of the CONTRACTOR.
- B. Unless otherwise specified, portable sign supports shall be of the dimensions shown on the plans.

3.03 BARRICADES:

- A. Barricades shall be installed in conformity with the details noted on the plans or as directed by the ENGINEER.

3.04 VERTICAL PANELS:

- A. Vertical panels shall be installed in conformity with the details noted on the plans or as directed by the ENGINEER.

3.05 CONSTRUCTION TRAFFIC MARKINGS:

- A. Construction traffic markings shall be installed in conformity with TxDOT MUTCD, Part 5, Section 5E.01 and the details shown on the plans or as directed by the ENGINEER.

3.06 ABBREVIATED PAVEMENT MARKING FOR CONSTRUCTION:

- A. Abbreviated markings meeting all specification requirements shall be in place on all roadways on which traffic is allowed and where suitable standard pavement marking is not in place. The transverse location of the line(s) formed by the markings shall be as determined by the ENGINEER.
- B. Unless otherwise indicated, the abbreviated markings shall be placed as follows:

<u>Condition</u>	<u>Spacing</u>	<u>Length of Stripe</u>
Straight	40 feet approximately	48 inch
Curve greater than 2 degrees	20 feet maximum	48 inch
Curve less than or equal 2 degrees	40 feet maximum	48 inch

- C. Pavement markings shall be a minimum of 3-7/8 inches wide. Length and spacing will be in accordance with these specifications.
- D. The spacing of stripes may be modified by the ENGINEER. However, the maximum spacing specified above shall not be exceeded in any case.
- E. The CONTRACTOR will be responsible for maintaining the abbreviated pavement markings until standard pavement markings are in place.
- F. Abbreviated pavement markings shall be removed after all permanent markings have been placed.

3.07 CHANNELIZATION DEVICES:

A. Type "A" Barrels

1. Type "A" barrels shall be used during daylight hours only and shall not be equipped with warning lights of any type. The term "daylight hours" refers to those hours between dawn and dusk.

B. Type "B" Barrels

1. Type "B" barrels shall be equipped with warning lights. Type "B" barrels shall be used during nighttime hours only, unless otherwise shown on the plans or directed by the Project Manager. The term "nighttime hours" refers to those hours between dusk and dawn.

C. Traffic Cones

1. Traffic cones shall be installed in conformity with the plans and the TMUTCD or as directed by the ENGINEER.

D. Tubular Traffic Markers

1. The metal, concrete, or bituminous surface where the tubular traffic markers are to be placed shall be thoroughly cleaned.
2. Metal and concrete surfaces shall be sandblasted or wire brushed. Bituminous surfaces shall be cleaned in accordance with manufacturer's recommendations.
3. All loose sand, dust and other deleterious debris from cleaned mounting surfaces shall be removed.
4. Tubular traffic markers shall be installed in conformity with details and at locations shown on the plans or as directed by the ENGINEER and in accordance with the manufacturer's recommendation.
5. In the event that removal of an installation (temporary or permanent) is effected and the metal, concrete, or bituminous surface is damaged the CONTRACTOR shall repair and otherwise restore said surface to its original condition at no additional cost to the City.

6. All defective post(s), base(s), assembly unit(s), adhesive(s), or reflective sheeting contributing to the detriment of the intended function of the tubular traffic markers shall be replaced by the CONTRACTOR at no additional cost to the City.

E. Channelization devices shall be installed and of the type in accordance with the details shown on the plans. Barrels shall be as noted herein.

3.08 SEQUENTIAL ARROW DISPLAY:

A. Sequential arrow displays shall be used according to the requirements shown on the plans and as shown in TxDOT MUTCD.

3.09 CONSTRUCTION DETOURS:

A. The detours shall be constructed at the locations and to the lines and grades indicated. It shall be the entire responsibility of the CONTRACTOR to provide for the passage of traffic in comfort and safety without creating a dust problem.

3.10 CONSTRUCTION METHODS:

B. Prior to commencing construction, suitable "Construction Traffic Control" devices shall be installed to protect the workers and the public.

C. The CONTRACTOR shall be responsible for installing all markers, signs and barricades conforming to The Texas Manual on Uniform Traffic Control Devices and/or as indicated. If, in the opinion of the ENGINEER, additional markers, signs or barricades are needed in the interest of safety, the CONTRACTOR will install such as are required or as directed by the ENGINEER.

3.11 MAINTENANCE:

A. It shall be the CONTRACTOR'S responsibility to maintain, clean, move and replace if necessary, barricades, signs and traffic handling devices during the time required for construction of the project. Permanent barricades shall be constructed as required after the completion of the streets by drilling holes to place the posts and concrete foundations. Foundation concrete shall be cured before the rails are attached.

B. When no longer needed, all temporary barricades, signs and traffic handling devices shall be removed and the area restored to its original condition or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement of various items described in this specification, complete in place, will be made as a percentage of implementation of the Traffic Control Plan. All traffic control signs, barricades, vertical panels, construction traffic markings, abbreviated pavement markings, channelization devices, sequential arrow displays, construction detours or any other implementation devices shall be incidental to this item.

4.02 PAYMENT:

- A. The accepted quantities of construction traffic control devices shall be paid at the contract unit bid price per the unit of measurement noted above or as noted on the bid proposal.
- B. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 33 01 30.11 – STORM DRAIN CLEANING AND INSPECTION

1.00 GENERAL

1.01 Description

- A. Storm Drain Cleaning and Television Inspection.

1.02 RELATED SECTIONS

- A. Construction Drawings

1.03 DESCRIPTION

- A. The work shall include complete cleaning and internal inspection and television monitoring including all labor, tools and equipment and related items as may be required for the complete cleaning or clearing and internal inspection and television monitoring (include bypass plumbing, drain dewatering and associated work) of the storm drain and removing and disposing of all deposits cleaned from the drains.
- B. The work shall include the thorough cleaning of storm drains in order to permit an unrestricted inspection by closed circuit television. All storm drains will be cleared prior to television inspection. If the television inspection shows drains were improperly cleaned, the Owner will direct the appropriate cleaning and re-cleaning. Re-cleaning shall be done at no additional cost.

1.04 SUBMITTALS

- A. Submit proposed cleaning and televising equipment data, including Manufacturer's literature indicating product specifications.

2.00 PROCEDURES AND EQUIPMENT

2.01 DESCRIPTION

- A. The Contractor shall clean storm drains prior to internal inspection, utilizing cleaning equipment approved for use by the Engineer. The Contractor shall ensure that the price bid for the cleaning shall be sufficient payment for removing all shapes, sizes and quantities of debris.
- B. Cleaning equipment may consist of hydraulic high-pressure jet machines, heavy duty power rodding machines capable of cleaning distances covered under the Contract in one step and heavy-duty bucket machines that can be used to drag line work with buckets, brushes, scrapers, swabs or similar devices. The heavy-duty equipment may be necessary for the removal of roots or heavy debris.

- C. Power rodding equipment shall have the capability of spinning the rod either clockwise or counter-clockwise. The equipment shall also be capable of pushing or pulling the rod without rotating the machine.
- D. The Contractor will certify that backup cleaning equipment is available and can be delivered to the site within twenty-four (24) hours. The Contractor shall also submit his equipment list to the Owner before the commencement of the work.
- E. The equipment utilized shall be capable of removing all said sand, dirt, rocks and other debris, including roots (where ordered by the Owner), from the drain line to allow adequate internal inspection (in the opinion of the Owner) of all internal surfaces. The equipment used shall suit the conditions and size of the sewer to be cleaned. Cleaning shall be performed in the seventy-two (72) hour period immediately before closed circuit television inspection.
- F. All safety requirements outlined in the General Requirements, or required by the agencies having jurisdiction, shall be followed by the Contractor during cleaning operations. The cost of such precautions shall be included in the price bid for this item.
- G. All precautions shall be taken by the Contractor to protect the storm drain from damage that might result from the use of unsuitable equipment or improper use of approved cleaning equipment. Any drains damaged during the cleaning operations as a result of the Contractor's operations shall be promptly repaired to an acceptable condition (as determined by the Owner) by and at the expense of the Contractor. If the Contractor's cleaning equipment becomes immobilized within a storm drain, exits the line through broken pipe or portions break off within a storm drain, said equipment shall be retrieved at the Contractor's expense. The Contractor shall act immediately to remedy problems created by the cleaning procedure, which represent a hazard to the general public, such as a collapse of the ground surface above the storm drain. If equipment retrieval necessitates excavation, the Contractor shall be responsible for accomplishing the work at his own expense. Following removal of the equipment, the Contractor shall restore the line and the site in accordance with the construction specifications of the governing body having jurisdiction.

3.00 EXECUTION

3.01 DEBRIS REMOVAL & DISPOSAL

- A. Remove and collect silt debris and material of any kind and prevent material from being discharged into the drainage system. Dispose of all materials removed from existing pipe not designated as regulated material or Acid Producing Soil, as follows:
 - 1. Once material leaves the Project Limits, the Contractor is responsible for ensuring that the handling procedures, placement method, and disposal

- location are according to applicable Federal, State and local laws, rules, and requirements, including permits that may be issued for the Project.
2. If the disposal of excess material results in a violation notice from any governmental authority, immediately correct the violation. Indemnify and defend the Owner for any violation incurred, penalty assessed, or any claims, suits, losses, demands or damages of whatever kind or nature arising out of, or claimed to arise out of, the improper disposal of excess materials.
 3. If the Contractor does not correct the violation to the satisfaction of the governmental authority that issued the violation notice, the Contractor is responsible for assessed penalties, including costs incurred by the Owner to remedy the violation.
- B. For regulated materials, the Contractor shall pay fees associated with the removal and disposal of regulated materials. Submit the results of material sampling and analysis, waste facility application and acceptance documentation, and fee payment requirements to the Engineer at least 15 days before planned removal of regulated material. Submit to the Engineer a bill of lading for each truckload of regulated material removed from the Project Limits. Ensure that the bill of lading and waste manifest includes the following information:
1. Transport subcontractor name, address, permit number, and telephone number.
 2. Type and quantify of material removed;
 3. Weight of vehicle with weight slip;
 4. Recycling or disposal facility name, address, permit number, and telephone number.
 5. Date removed from the Project Limits;
 6. Signature for Transport vehicle operator.
- C. The Owner will sign the bills of lading for the Owner as the generator within the Project Limits. Submit 1 copy of the bill of lading to the Owner by the end of each working day that the transport vehicle leaves the site. The licensed hauler shall transport the regulated material to the disposal/recycling facility with no unauthorized stops in between, except as required by regulatory authority. The hauler shall use appropriate vehicles and operating practices to prevent spillage or leakage from occurring during transport. Remove excess soil adhering to the wheels or under carriage of the vehicle before leaving the Project Limits. If solid or water escapes to the public roads, immediately clean the road to restore it to the original condition and immediately notify the Engineer. Do not transport regulated material over public roads if they contain free liquid or are sufficiently wet to be potentially flowable during transport. Submit 1 copy of the documentation of the disposal facility's acceptance of the regulated material, including the weight ticket slips, to the Engineer and the county of origin within 15 days of acceptance at the disposal facility. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the regulated material for off-site management, that would require the return of waste, or if the chosen facility had violated any environmental regulation that may result in regulatory enforcement action. Propose and alternate disposal

facility, and obtain the RE's written approval of off-site management at such facility.

3.02 CLOSED CIRCUIT TELEVISION INSPECTION PROCEDURE AND EQUIPMENT

- A. The inspection will be done one (1) reach (distance between two consecutive manholes) at a time. The reach being inspected will be suitably isolation from the remainder of the sewer system by restricting all upstream flows to allow maximum exposure of the pipe being inspected.
- B. In some instances, more than one (1) sewer reach may have to be inspected per set up (buried manholes). In these instances, the Contractor shall have adequate cable to deploy the television camera.
- C. Television equipment used for the inspection shall be specifically designed and constructed for storm drain inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions and shall be capable of showing the entire inside periphery of the pipe. The camera shall develop and transmit a sharp picture on video bandwidths only. Picture transmission systems that require the use of R.F. suppressors and are subject to local transmitters' interference shall not be used. The camera shall be equipped with an automatic light compensating iris, adjustable optical focus and automatic white balancing circuitry. The camera adjustments shall be set to produce a clear, sharp picture of the internal conditions within the storm drain. The camera lens shall be cleaned prior to each deployment in the storm drain. A television picture with interferences, lines, blurry vision or distortions will not be acceptable. Television equipment, if determined to be unsatisfactory by the Engineer, shall be removed from the job site and replaced with acceptable equipment at no additional cost. The Contractor shall certify that backup equipment is available and can be delivered to the site within twenty-four (24) hours. He shall also submit an equipment list to the Owner for approval before commencement of the work.
- D. The camera shall be moved through the storm drain in either direction (dependent upon the site's condition) at a uniform, slow rate (no greater than thirty [30] feet per minute) that will allow a clear visual picture to be obtained. The camera shall pause for a minimum of three (3) seconds at every joint or defect observed with the storm drain to allow proper observation. Camera movement through the storm drain shall be accomplished by means of a winch and cables or by a motorized transporter (self-propelled camera). The movement of the camera shall be remotely controlled by the television inspection operator from the inspection vehicle.
- E. The Contractor shall provide a mobile vehicle large enough to accommodate at least four (4) people at any one time for the purpose of viewing the monitor while the inspection is in progress. The owner's representative shall have access to view the television screen and observe all operations at all times.

3.03 RECORD OF INSPECTION

- A. The Contractor will log the results of all observations and prepare whatever data may be required for record purposes. Measurement for location of features along the pipe alignment shall be at ground level by means of a counting meter to be provided and operated by the Contractor. The counting meter shall be mounted on the television reel power winding assembly. The meter shall be equipped with a local mechanical readout for use at the rear of the television vehicle and an electronic counter which is connected to the data view system for display on the video tape. Marking on cable, or the like, which would require interpolation for depth of manhole will not be allowed. The counting meter shall accurately record the distance in feet, which the video cable has traveled. The measurement will be accurate to three-tenths (0.3) of a foot per ten (10) feet of inspected sewer reach length.
- B. The Contractor shall furnish all equipment for video DVD recording. All storm drain inspections shall be recorded on DVD and provided to the Owner for future reference. The video DVD recording shall begin at the center of the manhole of camera entry. The Contractor shall describe all features encountered while moving the camera from the center of the entry manhole to the distance in the pipe where he sets his footage meter. An audio recording of estimated footages shall be made for all features described prior to setting the footage meter. On the DVD, the Contractor shall provide during the actual television inspection an audio description of all defects, service connections, joints, discharges or other features considered important by the Owner.
- C. The date of the television inspection and the distance that the camera has traveled through a particular storm drain reach shall be continuously displayed on the recorded DVD. All DVDs obtained during the work shall be turned over to the City and shall become the property of the owner. All costs for DVD recordings shall be included in the prices bid. If the DVD recording is not complete or the quality is not satisfactory, the storm drain shall be reinspected at the Contractor's expense. The Contractor shall make a recording, audio and video, of any defects encountered in manholes designated as ingress and egress locations for internal inspection.

3.04 OBSTRUCTIONS

- A. Obstructions may be encountered during the course of the internal inspection that prevents the travel of the camera. Each occurrence shall be considered separately. Generally, however, the Contractor shall first attempt to pass the obstruction, and if failing in his attempt or if equipment damage may occur, withdraw the equipment and attempt internal inspections from the opposite end of the storm drain under inspection. Should additional obstructions be encountered after the first re-employment and no means are available for passing the obstructions without damage to the equipment, then the remaining sections of the storm drain not inspected shall be excluded from the work requirements of the Contract. No additional payment shall be made due to

difficulties encountered during internal inspection. In addition, the Contractor shall have no claim for payment for internal inspection not completed due to obstructions.

- B. Some obstructions may be encountered which prevent the Contractor from stringing the cables used to move a television camera deployed by winches. An alternate method of moving the camera shall be employed. The internal inspection shall be attempted to determine the condition of as much of the storm drain as possible. The Contractor shall select the method of performing the internal inspection, i.e., pushing the camera with rods or a jet cleaning machine, or use of a self-propelled camera approved by the Owner. The extent of the internal inspection accomplishment shall be at the discretion of the Owner. Should the Contractor's internal inspection equipment become immobilized within a storm drain, said equipment shall be removed from the line. If excavation is required to retrieve the Contractor's equipment, the excavation shall be accomplished by the Contractor at his expense. Following removal of the equipment, the Contractor shall restore the storm drain and the site in accordance with the construction specifications of the governing body having jurisdiction.

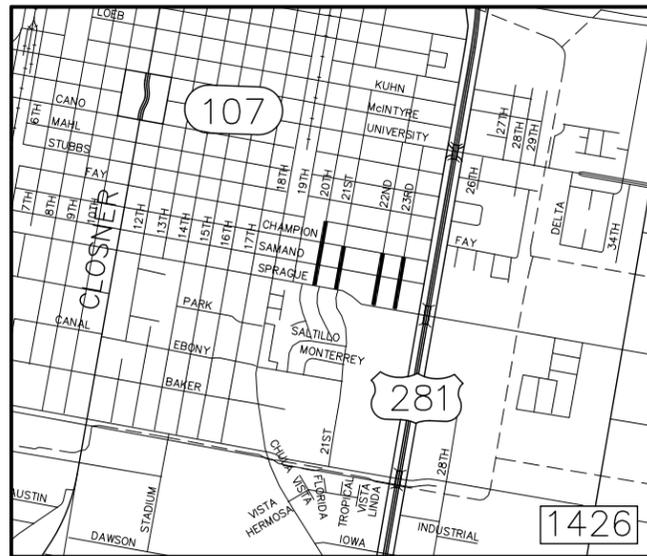
3.05 STORM DRAIN DEWATERING

- A. During the television inspection process, every effort shall be exerted to obtain a full view of the pipe interior. For instances where the camera lens becomes submerged or where a portion of the pipe shall contain water, the Contractor shall attempt to dewater the pipe. It is the intent of the City to obtain a clear, unobstructed view of the entire perimeter of the storm sewer segment being studied. The City shall determine when dewatering procedures are necessary. Dewatering can be accomplished with a pump and discharge hose or by the nozzle of a hydraulic high-pressure jet machine. If the jet machine is used, it shall precede the television camera through the sewer pipe. The nozzle of the jet machine shall work in conjunction with the television camera's motion and be positioned so that several feet of pipe length can be viewed by the camera. The dewatering procedure shall move standing or ponded water through the storm drain to a point within the storm drain downstream of the reach being inspected. Any required plugging upstream and downstream of the studied reach shall be subsidiary to other bid items as noted herein.

4.00 TRAFFIC CONTROL

Traffic Control and implementation shall be in conformance with City ordinances and guidelines, according to the latest MUTCD standards, and TxDOT specifications as determined by the Owner.

END OF SECTION



LOCATION MAP:
N.T.S.

PROJECT CONTACTS:

CIVIL ENGINEERING FIRM:

SDI ENGINEERING, L.L.C.
5602 E. IOWA RD.
EDINBURG, TEXAS 78542
ISABEL POSADAS, P.E.
PHONE: (956) 287-1818
FAX: (956) 287-3697
E-MAIL: info@sdi-engineering.com

NOTE:

CONTRACTORS SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES FOUND ON THESE SET OF DRAWINGS, PRIOR TO ANY CONSTRUCTION.



**SOUTH EAST ORIGINAL
TOWNSITE DRAINAGE
IMPROVEMENTS**

RFP 2019-08

CITY OF EDINBURG CITY COUNCIL

RICHARD MOLINA MAYOR
DAVID TORRES MAYOR PRO TEM
HOMER JASSO, JR. COUNCIL MEMBER
GILBERT ENRIQUEZ COUNCIL MEMBER
JORGE SALINAS COUNCIL MEMBER



CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS 78542 (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

INDEX TO SHEETS:

ST. COVER SHEET:

C-1 COVER & INDEX SHEET

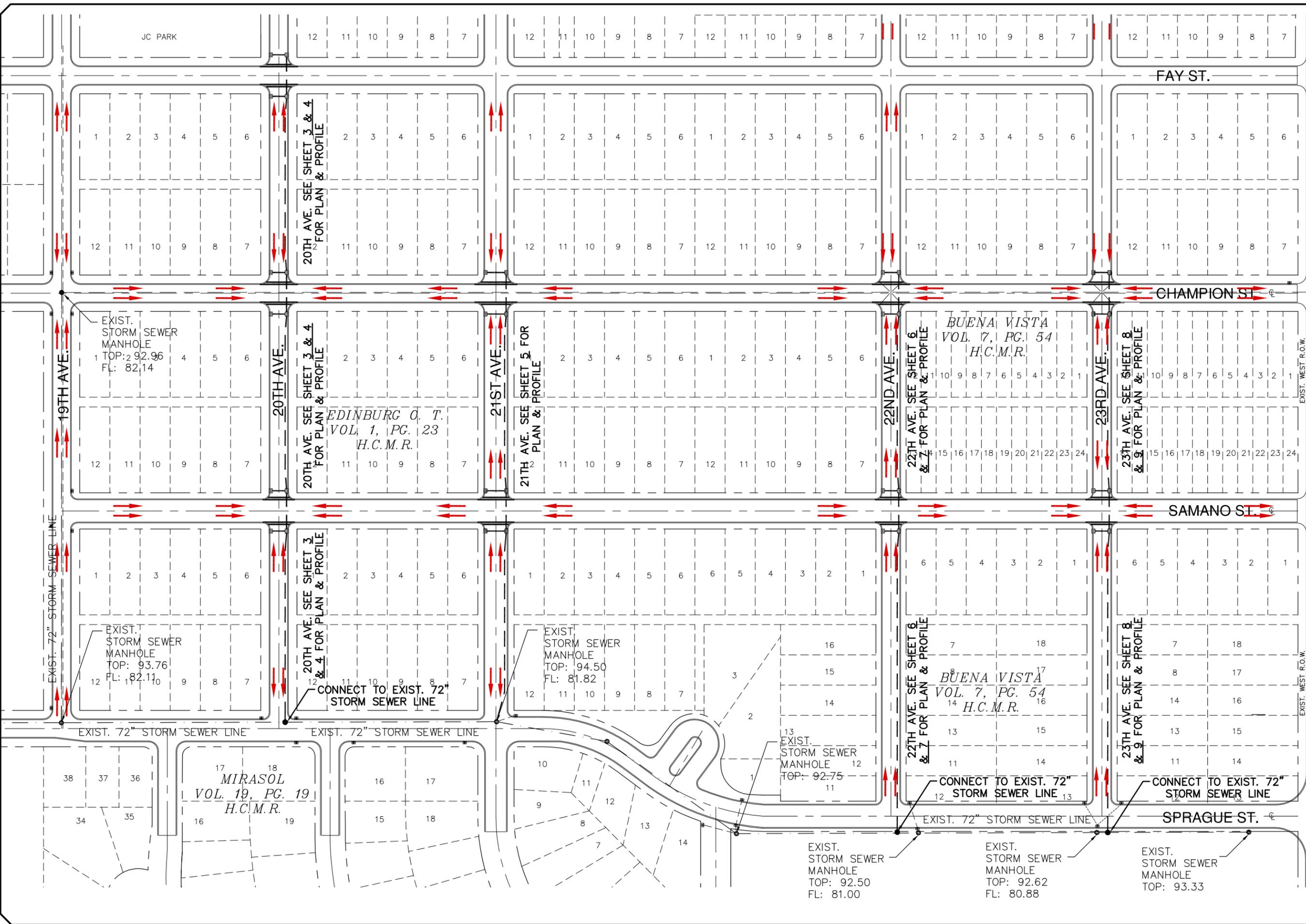
CIVIL IMPROVEMENTS:

- 1 OVERALL SITE IMPROVEMENTS
- 2 GENERAL NOTES & PROJECT LIMITS
- 3 20TH AVE. - PLAN & PROFILE
- 4 20TH AVE. - PLAN & PROFILE
- 5 21ST AVE. - PLAN & PROFILE
- 6 22ND AVE. - PLAN & PROFILE
- 7 22ND AVE. - PLAN & PROFILE
- 8 23ND AVE. - PLAN & PROFILE
- 9 23RD AVE. - PLAN & PROFILE
- 10 DRAINAGE DETAILS
- 11 DRAINAGE DETAILS



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 DRAINAGE IMPROVEMENTS
 OVERALL IMPROVEMENTS

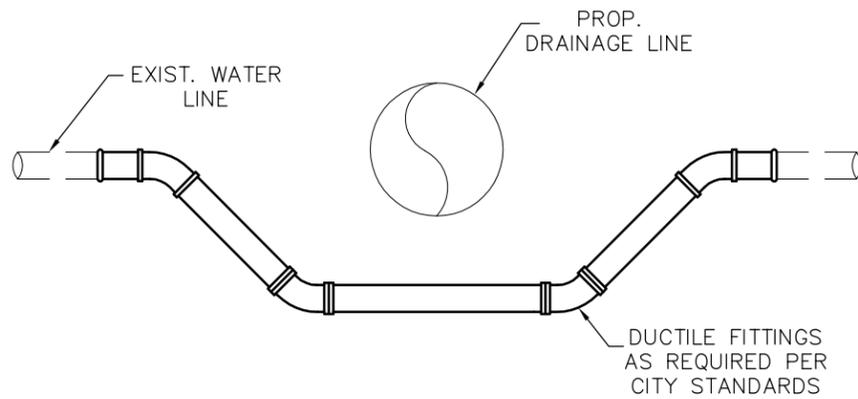
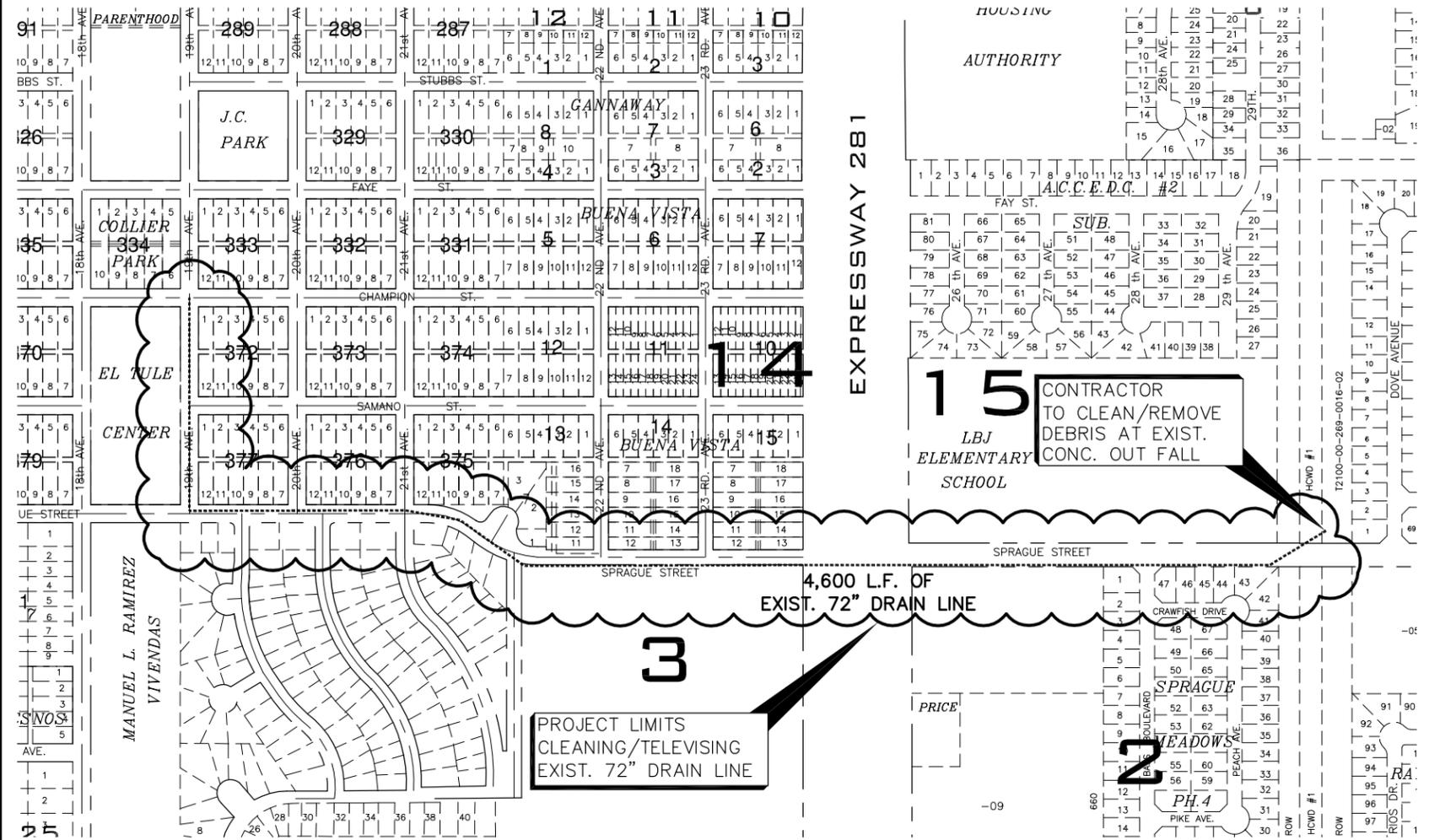
SDI ENGINEERING, LLC
 CIVIL • TRANSPORTATION • PLANNING • STORMWATER
 5602 E. IOWA RD., EDINBURG, TEXAS (936) 287-1888 PH. (936) 287-3697 FAX
 INFO@SDI-ENGINEERING.COM
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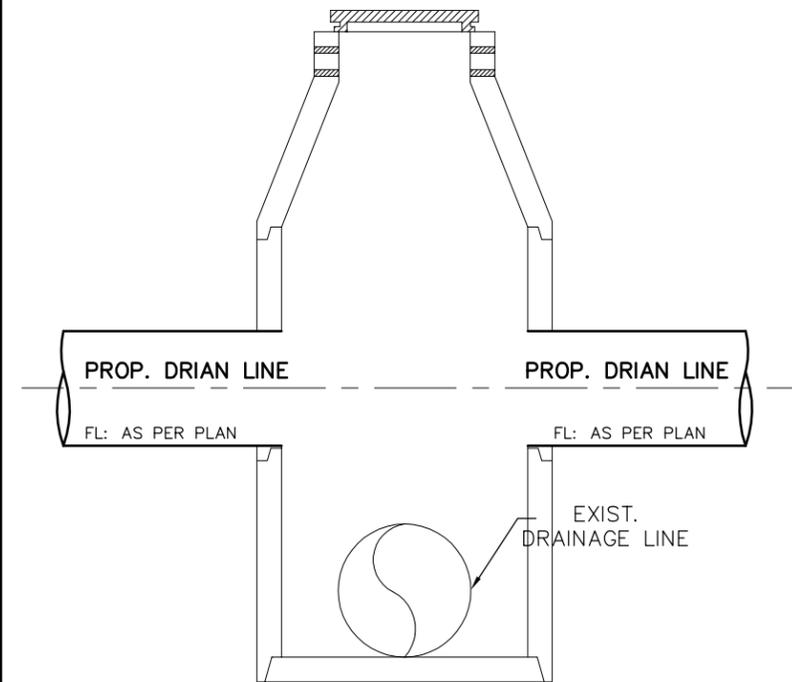
STATE OF TEXAS
 ISRAEL POSADAS
 89435
 LICENSED PROFESSIONAL ENGINEER
 EXPIRES 09/01/2018
 I signed and sealed this document on this date: 10/31/18
 THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISRAEL POSADAS, P.E. No. 89435 ON OCTOBER 31, 2018. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.
 DATE: 10/31/18
 SHEET NO.: 1 OF 11

GENERAL NOTES:

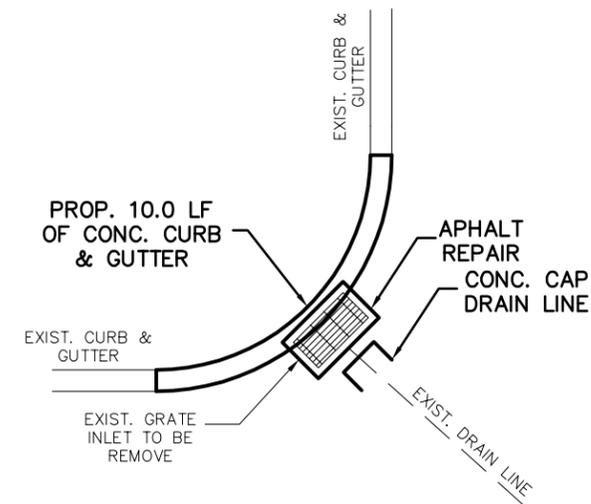
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PUBLIC OR PRIVATE UTILITIES PRIOR TO CONSTRUCTION. LOCATIONS AND GRADES OF EXISTING UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REPAIRS TO DAMAGED LINES AT NO ADDITIONAL COST TO THE OWNER.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH THE JOBSITE.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFEGUARDING AND PROTECTING ALL MATERIAL AND EQUIPMENT STORED ON THE JOBSITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STORAGE OF MATERIALS IN A SAFE AND WORKMANLIKE MANNER TO PREVENT INJURIES, DURING AND AFTER WORKING HOURS, UNTIL PROJECT COMPLETION.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS AND CONSTRUCTION INSPECTIONS WITH THE PROPER REGULATORY AGENCIES, PRIOR TO BEGINNING CONSTRUCTION. COPIES OF ALL PERMITS SHALL BE SENT TO THE ENGINEER.
5. THE DRAWINGS SHOW AS MUCH INFORMATION AS CAN BE REASONABLE OBTAINED FROM ON THE GROUND OBSERVATION AND EXISTING CONSTRUCTION DRAWINGS REGARDING THE ENTIRE TOPOGRAPHY, CONTOURS, SUB-SURFACE SOILS, AS WELL AS THE LOCATION AND NATURE OF PIPELINES, STORM SEWERS, WATERLINES, NATURAL GAS LINES, UNDERGROUND CABLES, ETC. HOWEVER, THE ACCURACY OF OR COMPLETENESS OF SUCH INFORMATION IS NOT GUARANTEED.
6. CONTRACTOR SHALL COMPLY WITH ALL OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.) REGULATIONS.
7. ALL WORK IS TO BE DONE IN ACCORDANCE WITH APPLICABLE NATIONAL, STATE MUNICIPAL AND LOCAL CODES.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SUPERVISE AND COORDINATE ALL WORK TO INSURE THE PROPER EXECUTION, ALL WORK IS TO BE ACCOMPLISHED IN A NEAT, WORKMAN LIKE MANNER, AND ALL EXCESS MATERIALS, TRASH AND DEBRIS, ETC., SHALL BE REMOVED FROM THE JOB BY THE CONTRACTOR, AT THEIR EXPENSE.
9. THE CONTRACTOR SHALL KEEP ALL STREETS FREE OF DIRT, MUD, ETC. DURING THE COURSE OF CONSTRUCTIONS.
10. EXISTING PAVEMENTS, CURBS, SIDEWALKS, AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO IN ACCORDANCE TO ENGINEERING STANDARDS.
11. CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF JOB, SHALL BE AS GOOD AS OR BETTER THAN THE CONDITION PRIOR TO STARTING WORK.
12. BACKFILL TO TOP OF NEW PAVEMENT OR CURBS WITH CLEAN SOIL FREE OF CLODS. ALL DISTURBED AREAS AND AREAS REQUIRING GRADING SHALL BE FINE GRADED, REMOVE ALL TRASH/DEBRIS AND PROVIDE A SMOOTH SURFACE FOR PROPER TURF MANAGEMENT. HYDROMULCH DISTURBED AREAS NOT NOTED TO BE SOLID SOD OR AS DIRECTED BY THE ENGINEER.
13. CONTRACTOR SHALL EXERCISE CARE IN REMOVING/TRANSPORTING ANY ITEMS DEEMED SALVAGEABLE BY OWNER.
14. ANY ITEM DAMAGED OR UNSUITABLE FOR USE SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.



WATERLINE CONFLICT REPAIR



INTERCONNECT MANHOLE 48" DIA (TYP.)



DETAIL "A" INLET REMOVAL (TYP.)

FILE NAME:	
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EXIST. 72" STORM SEWER LINE

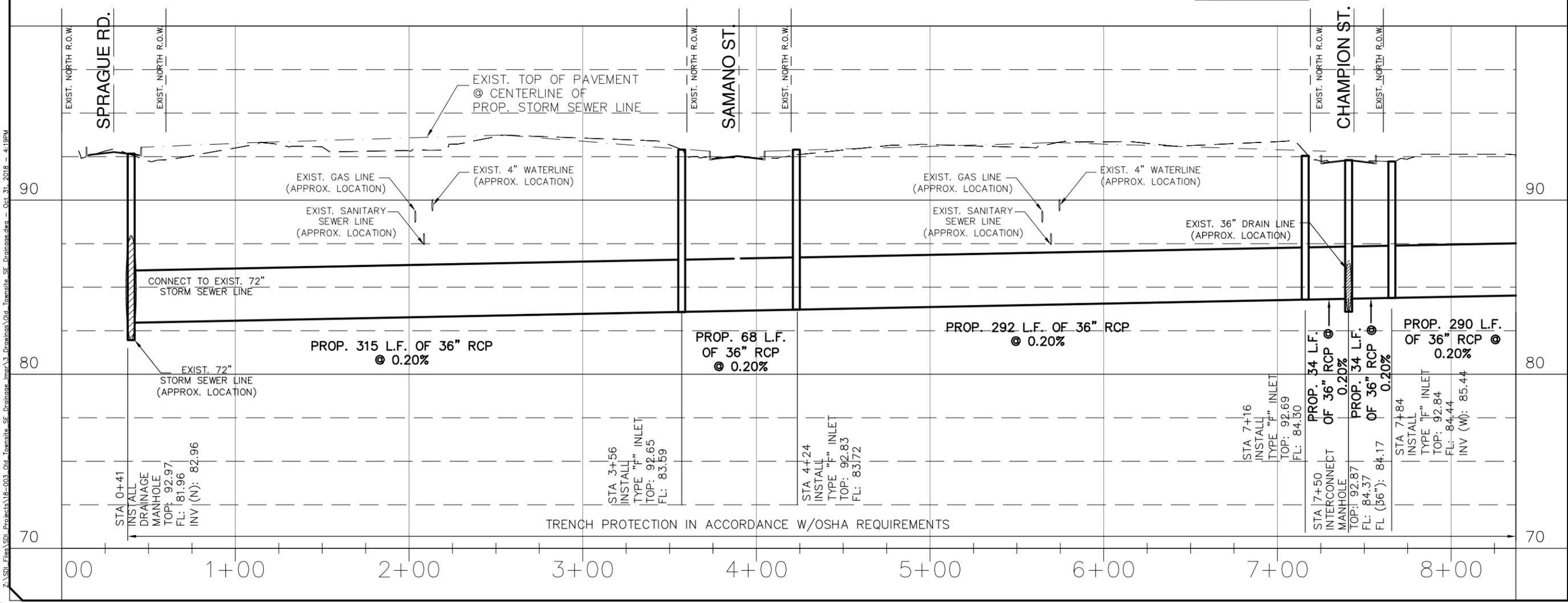
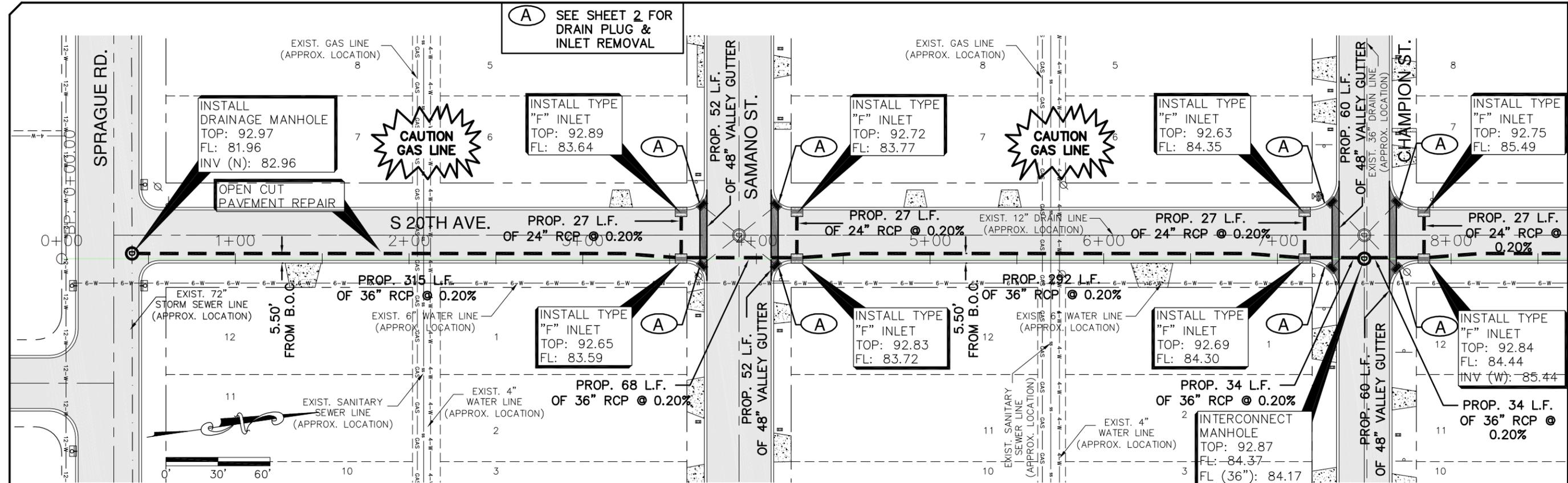
SDI ENGINEERING, LLC
 CIVIL • TRANSPORTATION • PLANNING • STORMWATER
 5602 E. IOWA RD., EDINBURG, TEXAS (936) 287-1888 PH. (936) 287-3697 FAX
 INFO@SDI-ENGINEERING.COM
 TBPB REG. NO. F-13016

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SCALE:	HALF: N.T.S.

TBPB REG. NO. F-13016

DATE: 10/31/18

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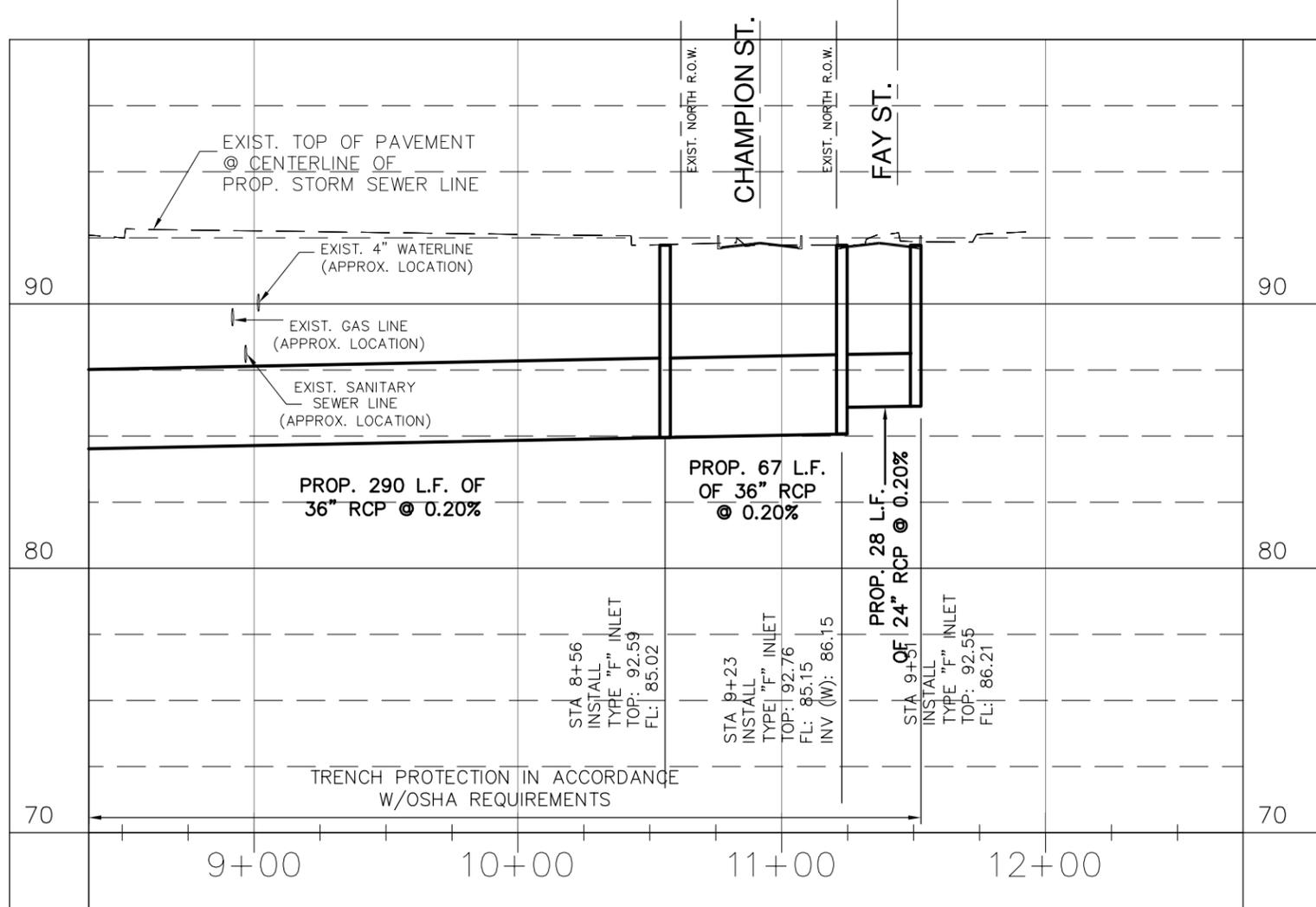
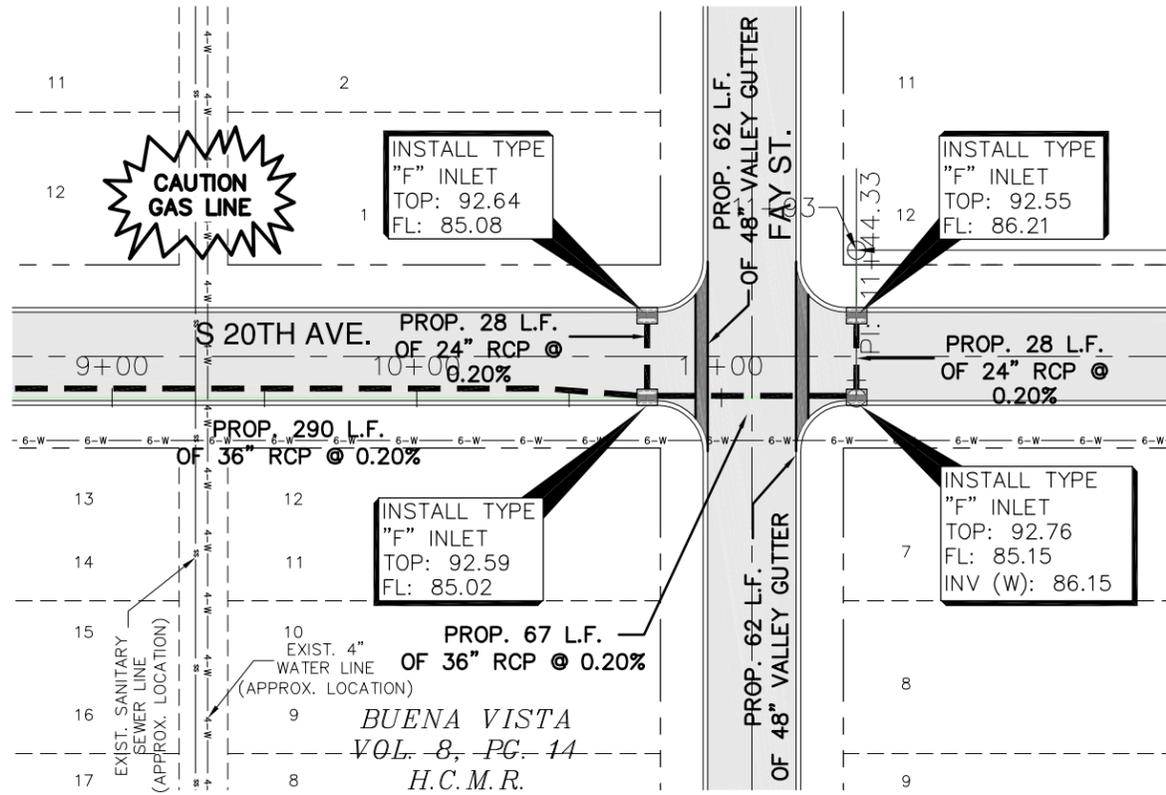
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 20TH AVE. - PLAN & PROFILE

SDI ENGINEERING, LLC
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 5602 E. IOWA RD., EDINBURG, TEXAS 75841 287-1888 PH. (956) 287-3697 FAX
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TITLE: SOUTH EAST ORIGINAL TOWNSITE DRAINAGE IMPROVEMENTS
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5602 E. IOWA RD., EDINBURG, TEXAS 75841
INFO@SDI-ENGINEERING.COM
TBPB REG. NO. F-13016

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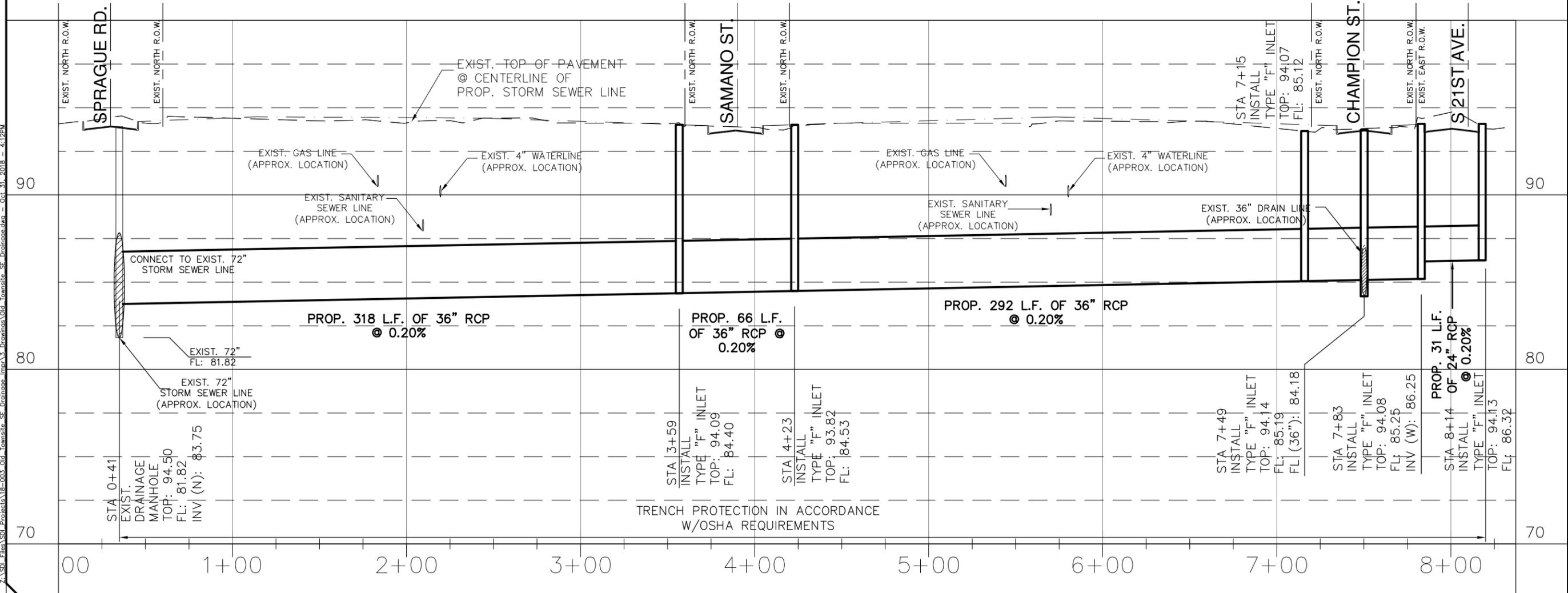
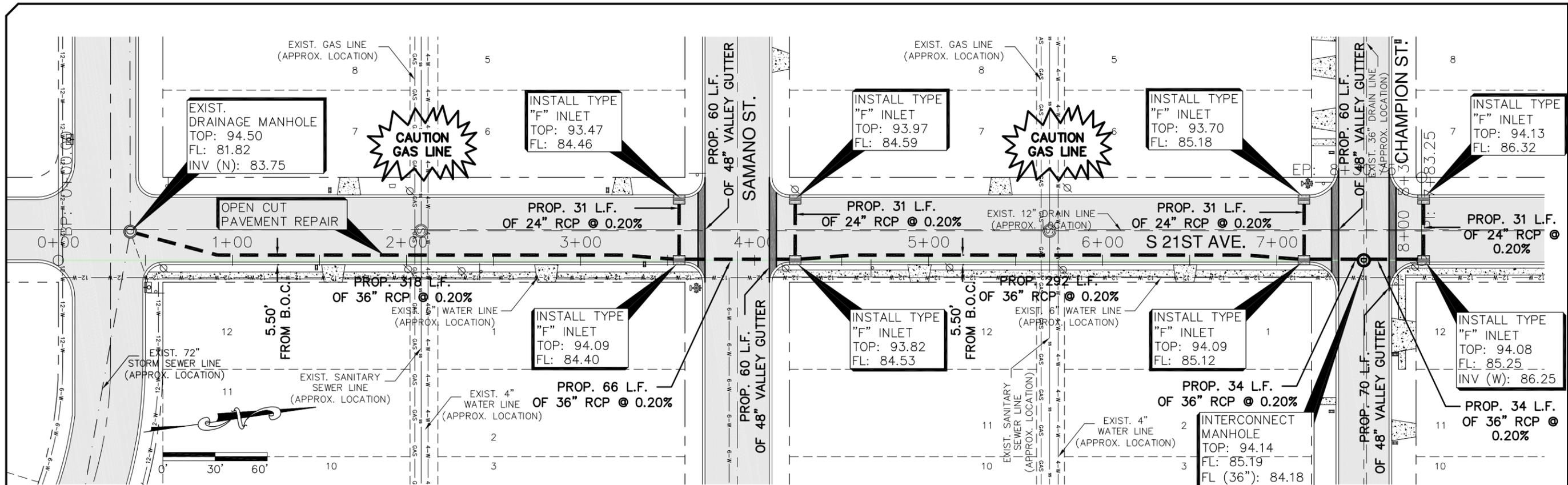
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STATE OF TEXAS
ISRAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
IPE 1013118

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 21ST AVE. - PLAN & PROFILE

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 CIVIL • TRANSPORTATION • PLANNING • STORMWATER
 5602 E. IOWA RD., EDINBURG, TEXAS 75116 PH. (956) 287-3697 FAX
 INFO@SDI-ENGINEERING.COM
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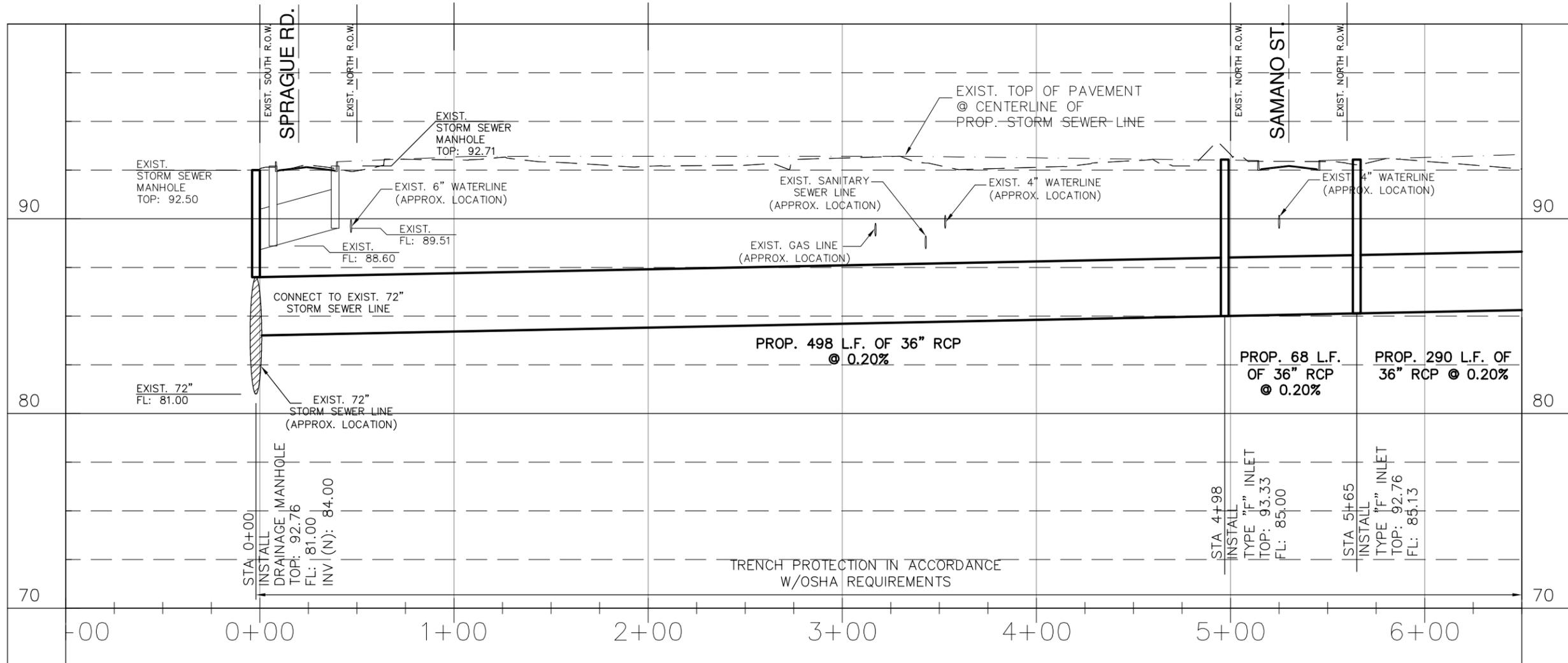
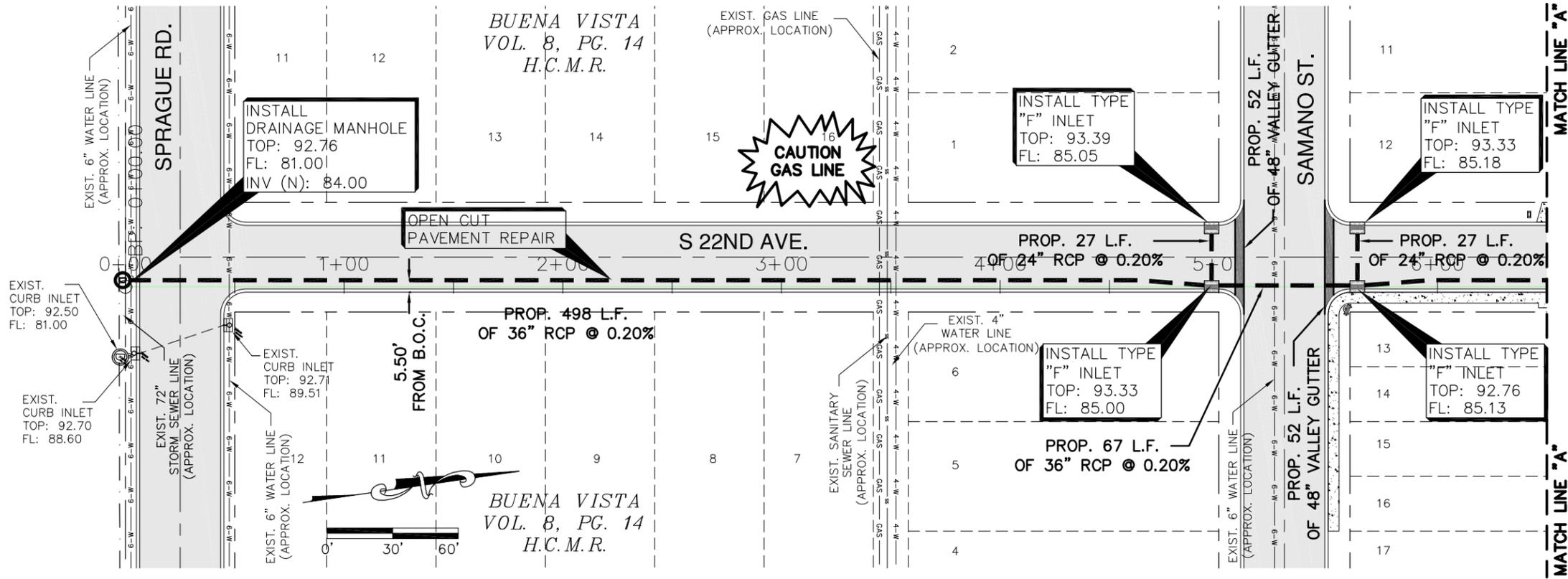
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STATE OF TEXAS
 ISABEL POSADAS
 89435
 LICENSED PROFESSIONAL ENGINEER
 (Professional Seal)

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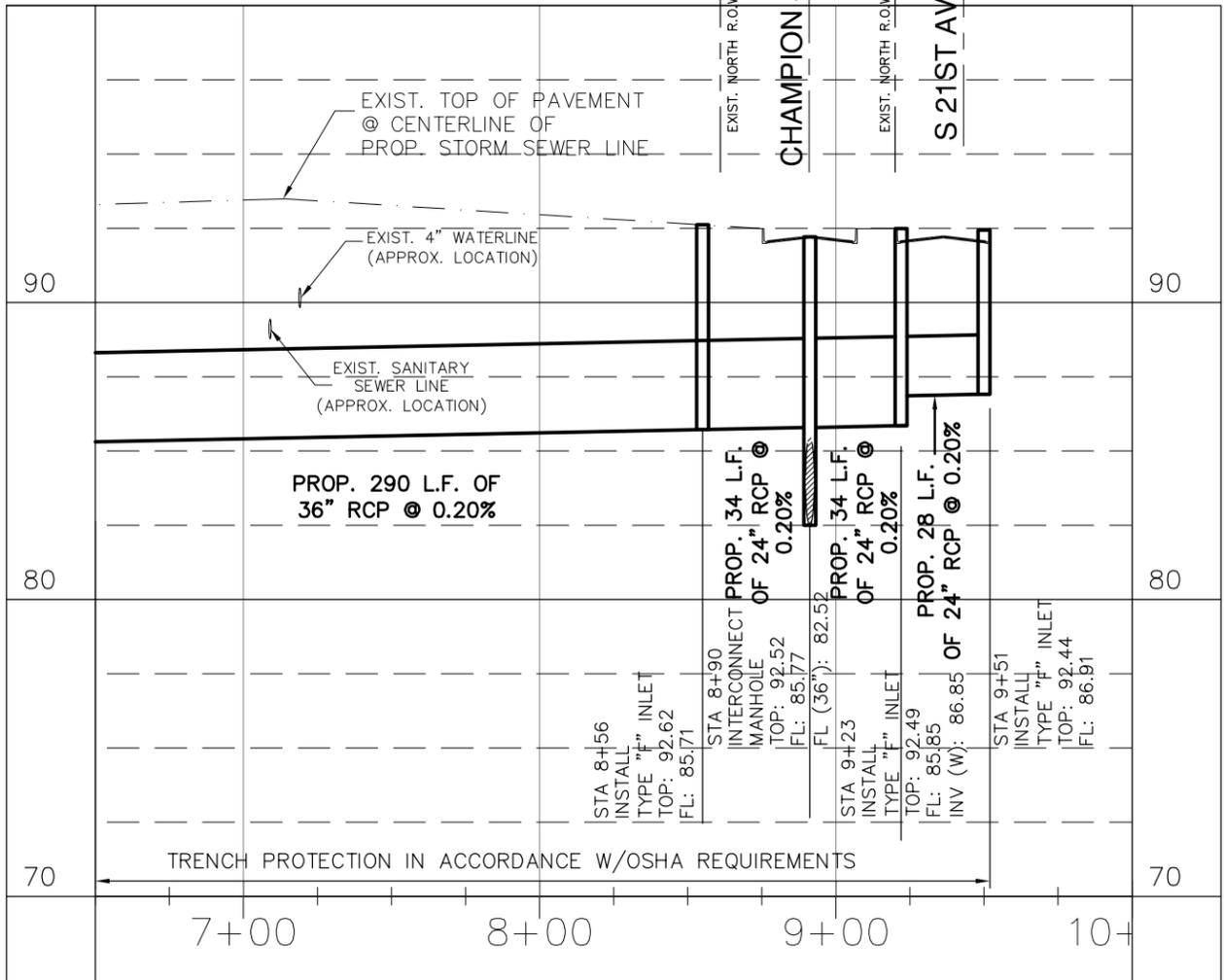
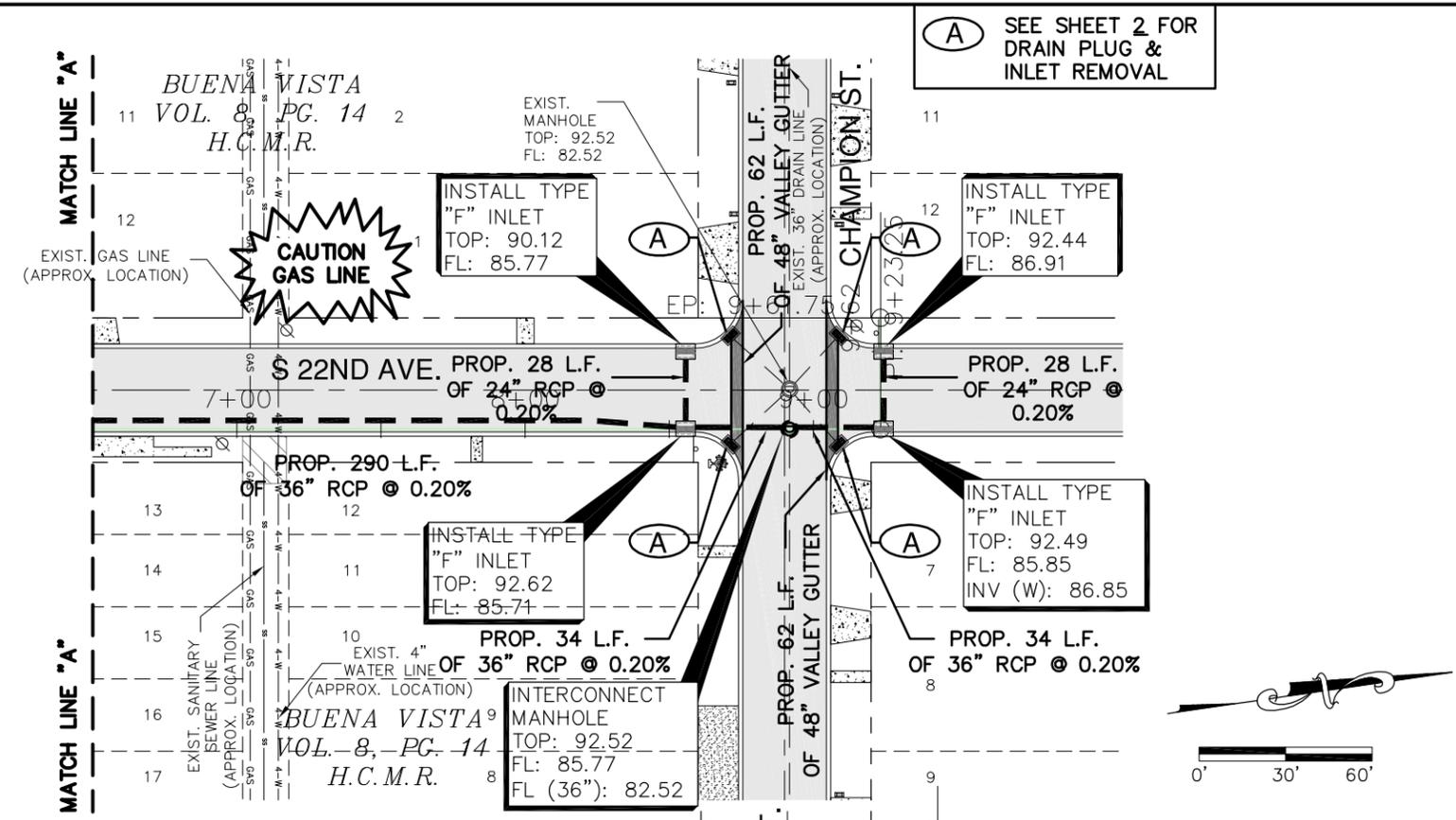
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 22ND AVE. - PLAN & PROFILE

SDI ENGINEERING, LLC
 CIVIL • TRANSPORTATION • PLANNING • STORMWATER
 5602 E. IOWA RD., EDINBURG, TEXAS 75116 PH: (956) 287-3697 FAX
 INFO@SDI-ENGINEERING.COM
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(A) SEE SHEET 2 FOR DRAIN PLUG & INLET REMOVAL

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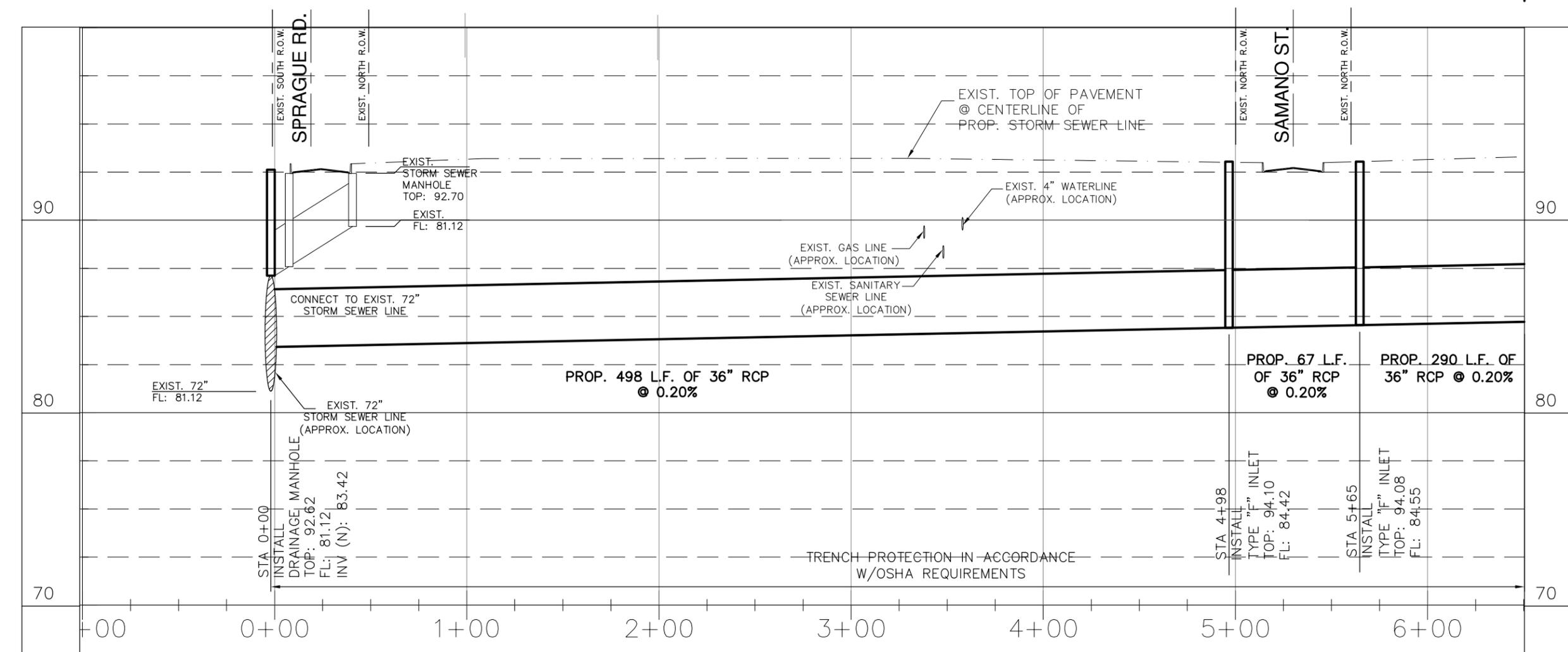
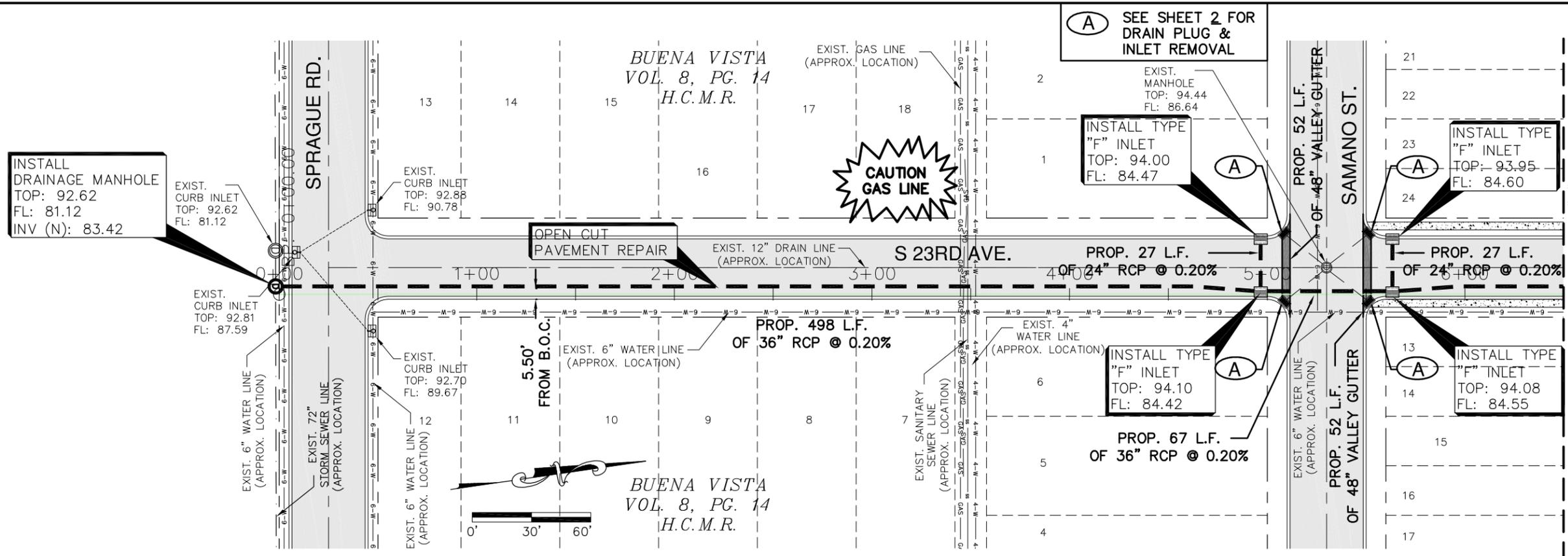
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STATE OF TEXAS
ISRAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

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23RD AVE. - PLAN & PROFILE

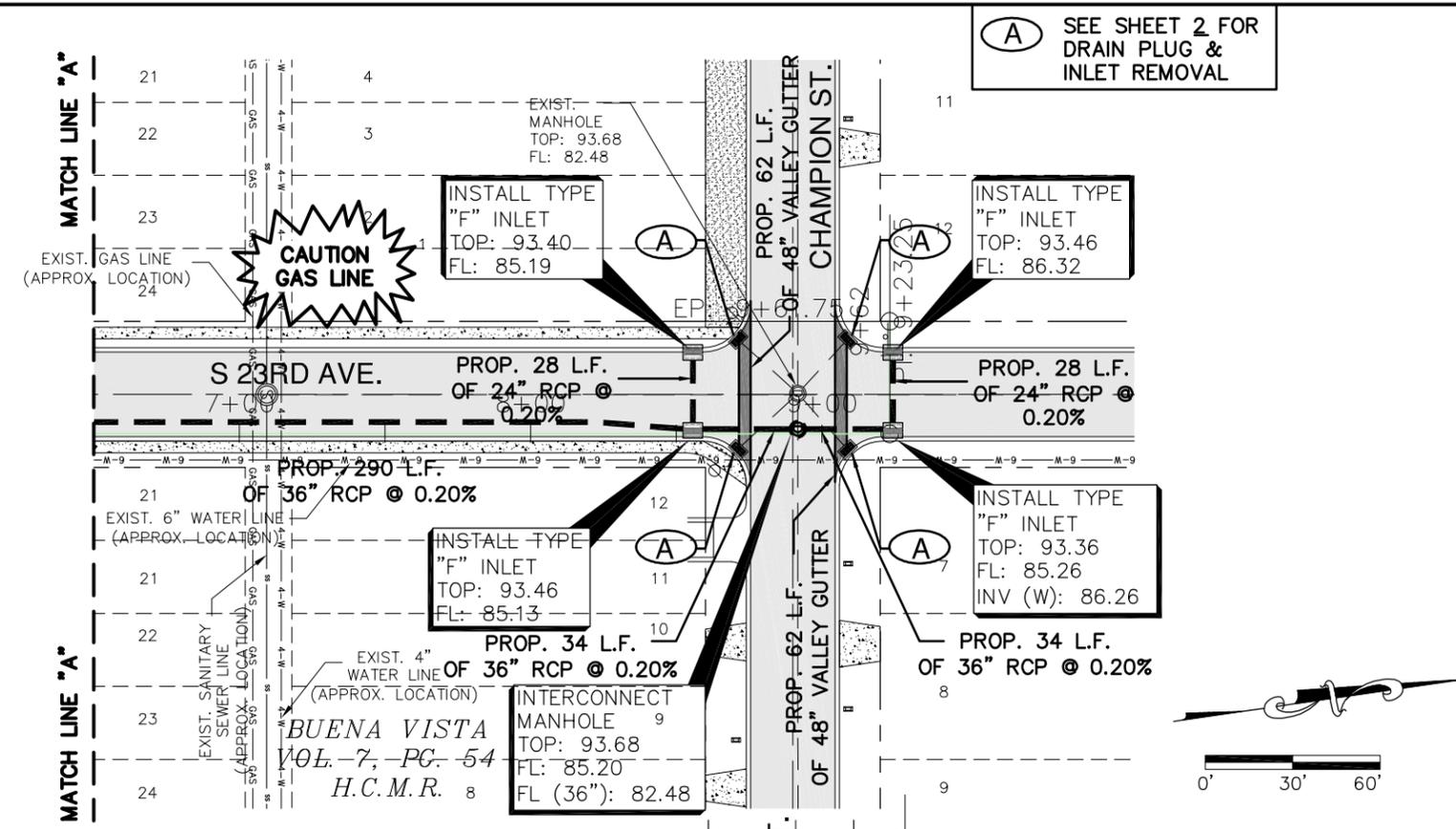
SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS 75116 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
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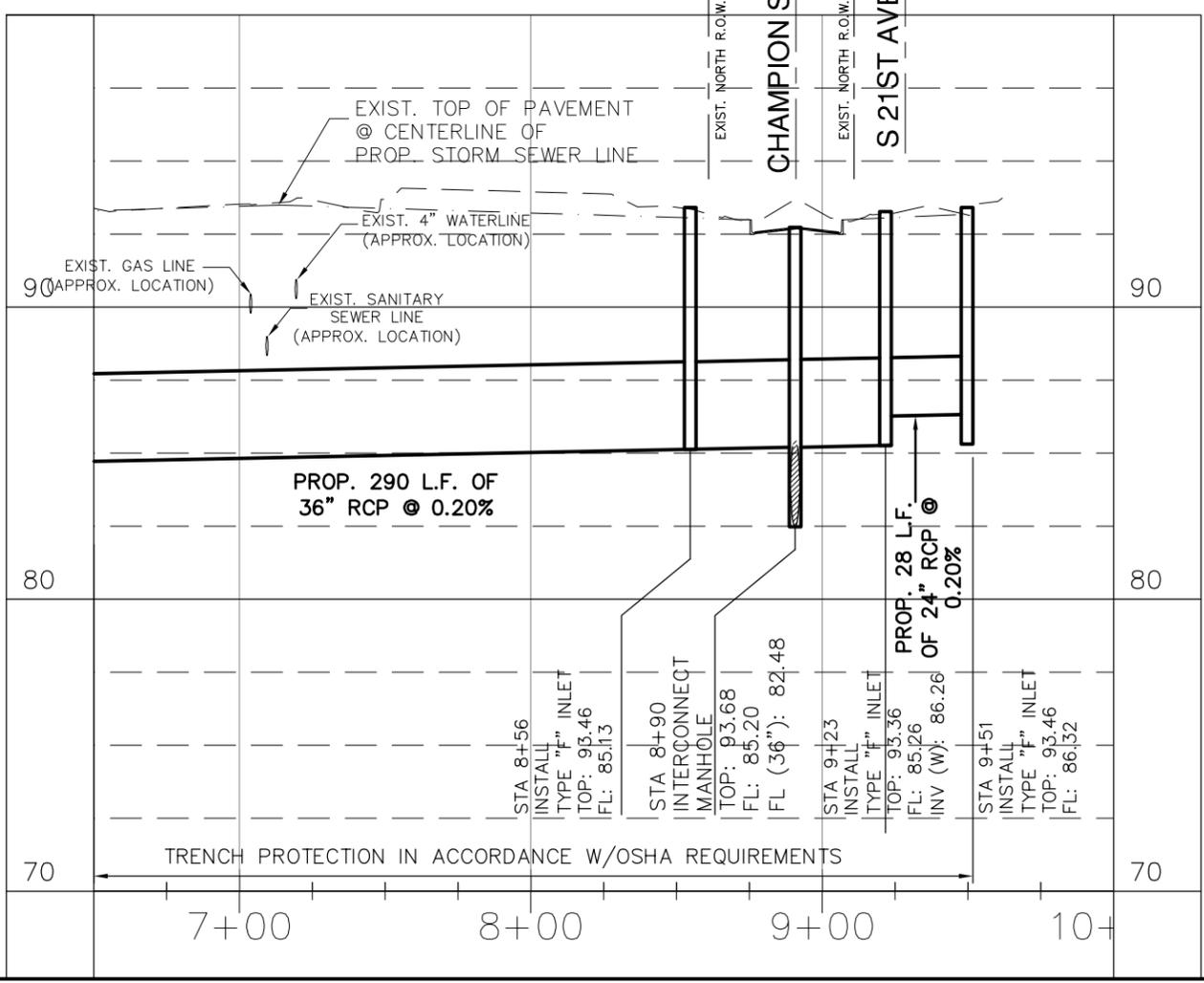
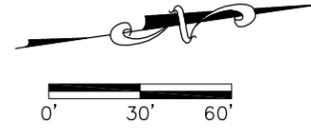
ISRAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

DATE: 10/31/18
SHEET NO.: 8 OF 11

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(A) SEE SHEET 2 FOR DRAIN PLUG & INLET REMOVAL



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23RD AVE. - PLAN & PROFILE

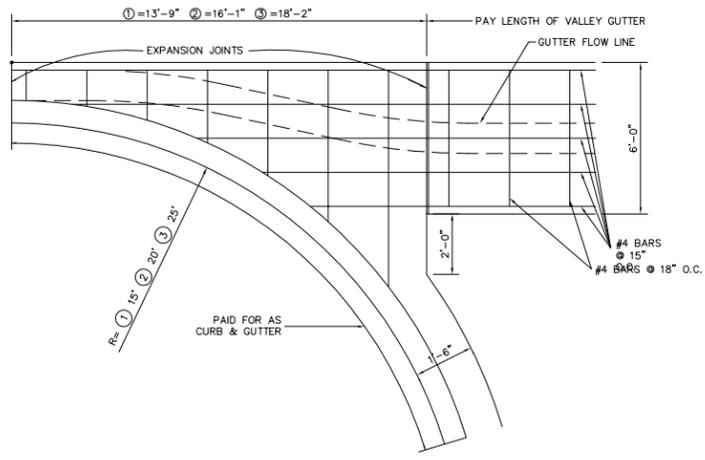
SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS 75116 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPB REG. NO. F-13016

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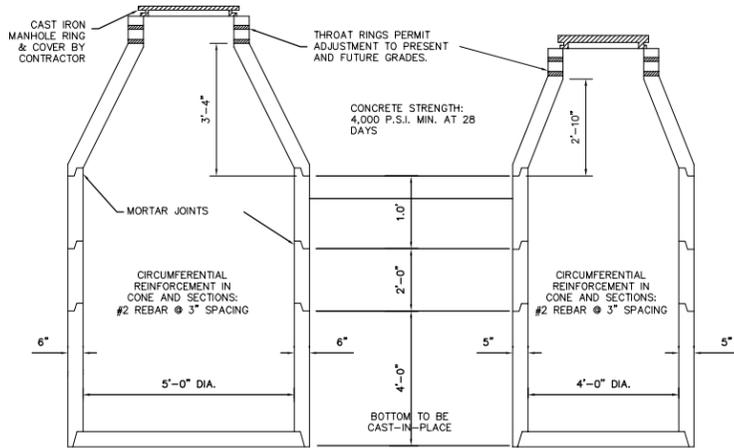
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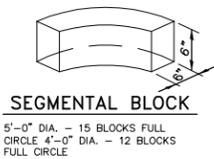
VALLEY GUTTER DETAIL



WEIGHTS OF 5'-0" DIA. MANHOLE		MANHOLES SECTIONS ARE CAST IN		WEIGHTS OF 4'-0" DIA. MANHOLE	
THROAT RING	90 LBS.	1'-0" LENGTHS	15 BLOCKS FULL CIRCLE	THROAT RING	90 LBS.
CONE SECTION	2800 LBS.	1'-0" SECTION	15 BLOCKS FULL CIRCLE	CONE SECTION	1750 LBS.
1'-0" SECTION	1329 LBS.	2'-0" SECTION	15 BLOCKS FULL CIRCLE	1'-0" SECTION	875 LBS.
2'-0" SECTION	2658 LBS.	3'-0" SECTION	15 BLOCKS FULL CIRCLE	2'-0" SECTION	1750 LBS.
3'-0" SECTION	3987 LBS.	4'-0" SECTION	15 BLOCKS FULL CIRCLE	3'-0" SECTION	2625 LBS.
4'-0" SECTION	5316 LBS.			4'-0" SECTION	3500 LBS.



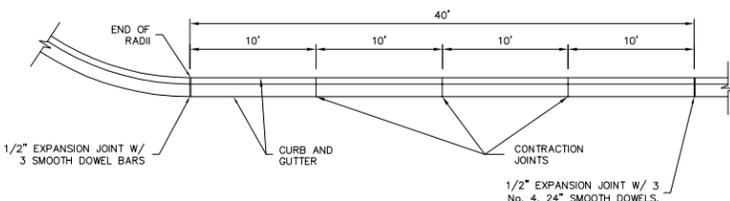
REINF. CONCRETE THROAT RING



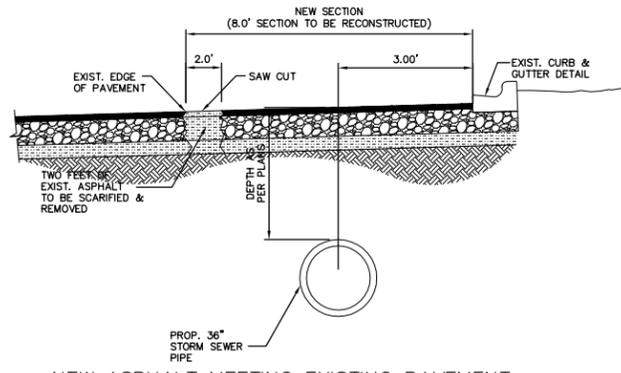
SEGMENTAL BLOCK

5'-0" DIA. - 15 BLOCKS FULL CIRCLE
4'-0" DIA. - 12 BLOCKS FULL CIRCLE

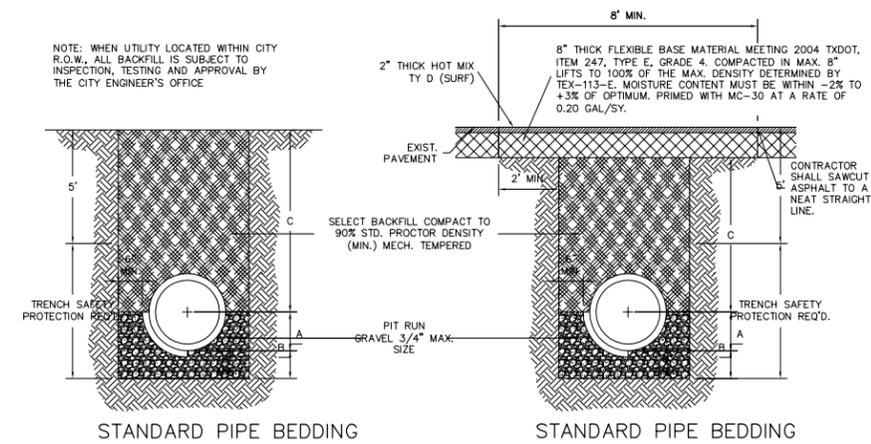
PRECAST CONCRETE MANHOLES - DETAILS



TYPICAL JOINTS
NOT TO SCALE



NEW ASPHALT MEETING EXISTING PAVEMENT



STANDARD PIPE BEDDING

STANDARD PIPE BEDDING

NOTE: WHEN UTILITY LOCATED WITHIN CITY R.O.W., ALL BACKFILL IS SUBJECT TO INSPECTION, TESTING AND APPROVAL BY THE CITY ENGINEER'S OFFICE.

A. GRAVEL (3/4" MAX. SIZE) BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. GRAVEL BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

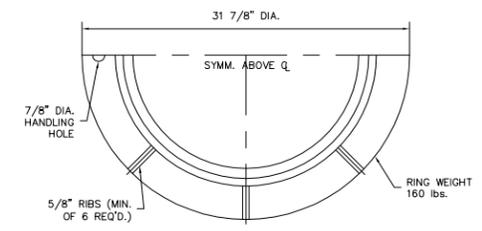
C. FILL TRENCH W/SELECT BACKFILL (P<20), W/12" LIFTS COMPACT TO 95% STD. PROCTOR

FOUNDATION PREPARATION (WELLPONTS, GRAVEL AND/OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

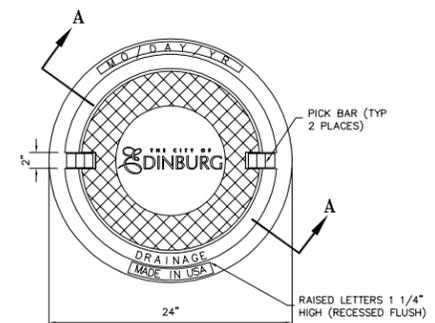
BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

NOTE: ALL EXISTING STREET CROSSINGS SHALL REQUIRE SAND BACKFILL OF ENTIRE TRENCH.

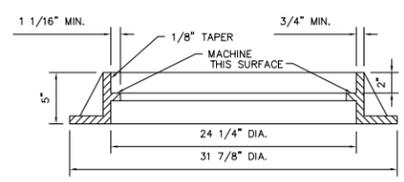
STANDARD PIPE BEDDING - DETAILS



RING SECTION

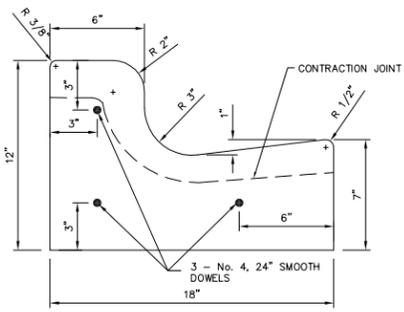


COVER TOP VIEW



SECTION A - A

CITY STANDARD ROADWAY MANHOLE RING & COVER CASTING DETAIL



CURB AND GUTTER DETAIL
NOT TO SCALE

GENERAL NOTES:
1. CONCRETE SHALL BE 3000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAY.
2. ALL CONCRETE WORK SHALL BE TREATED WITH MEMBRANE CURING COMPOUND TYPE 2 WHITE PIGMENTED IN ACCORDANCE W/ TEXAS DEPARTMENT OF TRANSPORTATION DEPARTMENTAL MATERIALS SPECIFICATION ITEM 4650, CONSIDERED INCIDENTAL TO CONCRETE WORK.
3. 1/2" EXPANSION JOINTS REQUIRED AT 40' C.C. AND AT THE BEGINNING AND END OF ALL RADI. CONTRACTION JOINTS SHALL NOT EXCEED 10' C.C.
4. EXPANSION JOINTS SHALL HAVE 1/2" EXPANSION JOINT MATERIAL, AND 3 No. 4, 24" SMOOTH DOWEL BARS COATED TO PREVENT BOND.

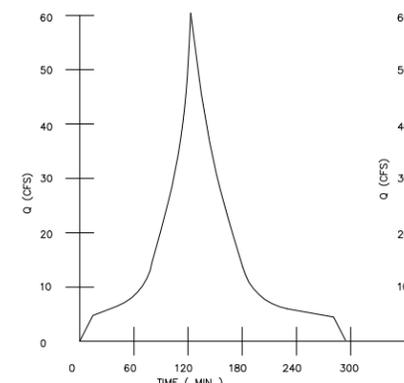


FIGURE 1-iii TYPICAL VARIABLE RAINFALL INTENSITY METHOD STORM WATER RUNOFF HYDROGRAPH.

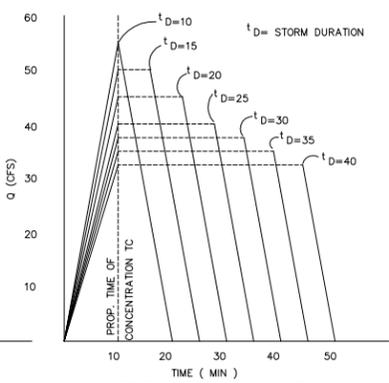


FIGURE 1-iv TYPICAL RATIONAL METHOD STORM WATER RUNOFF HYDROGRAPH.

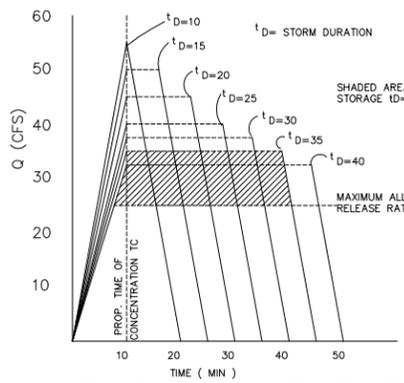


FIGURE 1-v TYPICAL MODIFIED RATIONAL METHOD STORM WATER RUNOFF HYDROGRAPH. STORAGE CALCULATION BY PEAK SHAVING

STORM WATER RUNOFF

TYPICAL 2" ASPHALT PAVEMENT SECTION

FILE NAME:
DATE: 6/5/18
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: SOUTH EAST ORIGINAL TOWNSITE DRAINAGE IMPROVEMENTS DRAINAGE DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (936) 287-1888 PH. (936) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TPE REG. NO. F-13016

FULL: N.T.S.
SCALE: HALF: 1"=60'

TPE REG. NO. F-13016

STATE OF TEXAS
ISRAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
EXPIRES 09/30/2018
THIS SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISRAEL POSADAS, P.E. No. 89435 ON OCTOBER 31, 2018. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 10/31/18
SHEET NO.: 10 OF 11

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