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SECTION II

General Contract Conditions

Bid Proposal

Contract Award

GENERAL CONTRACT CONDITIONS

1. Contract and Contract Documents

(a) The project to be constructed pursuant to this contract will be financed with assistance from the CDBG and is subject to all applicable Federal and State laws and regulations.

(b) The Plans, Specifications and Addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth.

2. Definitions

Whenever used in any of the contract Documents, the following meanings shall be given to the terms here in defined:

(a) The term "Contract" means the Contract executed between the Galveston County, hereinafter called the Owner and (Name of Construction Co.), hereinafter called Contractor, of which these GENERAL CONDITIONS, form a part.

(b) The term "Project Area" means the area within which are the specified Contract limits of the Improvements contemplated to be constructed in whole or in part under this contract.

(c) The term "Engineer" means Jarrod D. Aden, P.E., Lentz Engineering, LLC, Engineer in charge, serving the Owner with engineering services, his successor, or any other person or persons, employed by the Owner for the purpose of directing or having in charge the work embraced in this Contract.

(d) The term "Contract Documents" means and shall include the following: Executed Contract, Addenda (if any), Invitation for Bids, Instructions to Bidders, Signed Copy of Bid, General Conditions, Special Conditions, Technical Specifications, and Drawings (as listed in the Schedule of Drawings).

3. Supervision By Contractor

(a) Except where the Contractor is an individual and gives his personal supervision to the work, the Contractor shall provide a competent superintendent, satisfactory to the Local Public Agency and the Engineer, on the work at all times during working hours with full authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expediting of his work.

(b) The Contractor shall lay out his own work and he shall be responsible for all work executed by him under the Contract. He shall verify all figures and elevations before proceeding with the work and will be held responsible for any error resulting from his failure to do so.

4. Subcontracts

(a) The Contractor shall not execute an agreement with any subcontractor or permit any subcontractor to perform any work included in this contract until he has verified the subcontractor as eligible to participate in federally funded contracts.

(b) No proposed subcontractor shall be disapproved by the city/county except for cause.

(c) The Contractor shall be as fully responsible to the city/county for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work and required compliance by each subcontractor with the applicable provisions of the Contract.

(e) Nothing contained in the Contract shall create any contractual relation between any subcontractor and the Owner.

5. Fitting and Coordination of Work

The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, subcontractors, or material suppliers engaged upon this Contract.

6. Payments to Contractor

a. Partial Payments

1) The Contractor shall prepare his requisition for partial payment as of the last day of the month and submit it, with the required number of copies, to the Engineer for his approval. The amount of the payment due the Contractor shall be determined by adding to the total value of work completed to date, the value of materials properly stored on the site and deducting (1) ten percent (10%) of the total amount, to be retained until final payment and (2) the amount of all previous payments. The total value of work completed to date shall be based on the estimated quantities of work completed and on the unit prices contained in the agreement. The value of materials properly stored on the site shall be based upon the estimated quantities of such materials and the invoice prices. Copies of all invoices shall be available for inspection of the Engineer.

2) Monthly or partial payments made by the Owner to the Contractor are moneys advanced for the purpose of assisting the contractor to expedite the work of construction. The Contractor shall be responsible for the care and protection of all materials and work upon which payments have been made until final acceptance of such work and materials by the Owner. Such payments shall not constitute a waiver of the right of the Owner to require the fulfillment of all terms of the Contract and the delivery of all improvements embraced in this Contract complete and satisfactory to the Owner in all details.

b. Final Payment

1) After final inspection and acceptance by the Owner of all work under the Contract, the Contractor shall prepare his requisition for final payment which shall be based upon the careful inspection of each item of work at the applicable unit prices stipulated in the Agreement. The total amount of the final payment due the Contractor under this contract shall be the amount computed as described above less all previous payments.

2) The Owner before paying the final estimate, shall require the Contractor to furnish releases or receipts from all subcontractors having performed any work and all persons having supplied materials, equipment (installed on the Project) and services to the Contractor, if the Owner deems it necessary in order to protect its interest. The Owner may, if it deems such action advisable, make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments made shall in no way impair the obligations of any surety or sureties furnished under this Contract.

3) Any amount due the Owner under Liquidated Damages, shall be deducted from the final payment due the contractor.

c. Payments Subject to Submission of Certificates

Each payment to the Contractor by the Owner shall be made subject to submission by the Contractor of all written certifications required of him and his subcontractors.

d. Withholding Payments

The Owner may withhold from any payment due the Contractor whatever is deemed necessary to protect the Owner, and if so elects, may also withhold any amounts due from the Contractor to any subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Owner and will not require the Owner to determine or adjust any claims or disputes between the Contractor and his subcontractors or material dealers, or to withhold any moneys for their protection unless the Owner elects to do so. The failure or refusal of the Owner to withhold any moneys from the Contractor shall in no way impair the obligations of any surety or sureties under any bond or bonds furnished under this Contract.

7. Estimated Quantities

This Contract, including the specifications, plans and estimates, is intended to show clearly all the work to be done and material to be furnished hereunder. The estimated quantities of the various classes of work to be done and material to be furnished under this contract are approximate and are to be used as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It is understood and agreed that the actual amount of work to be done and material to be furnished under this contract may differ somewhat from these estimates, and that the basis for payment under this contract shall be the plan quantity or actual amount of such work done whichever is specified. It is further understood that the County does not guarantee any minimum amount of work under this Contract.

Contractor agrees that it will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this Contract and the estimated quantities contemplated and contained in the proposals.

8. Changes in the Work

(a) The Owner may make changes in the scope of work required to be performed by the Contractor under the Contract without relieving or releasing the Contractor from any of his obligations under the Contract or any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the guaranty bonds, and without relieving or releasing the surety or sureties of said bonds. All such work shall be executed under the terms of the original Contract unless it is

expressly provided otherwise. Additionally, all such change orders must be approved by the CDBG staff prior to execution of same.

(b) Except for the purpose of affording protection against any emergency endangering health, life, limb or property, the Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the improvements or supply additional labor, services or materials beyond that actually required for the execution of the Contract, unless in pursuance of a written order from the Owner authorizing the Contractor to proceed with the change. No claim for an adjustment of the Contract Price will be valid unless so ordered.

(c) It is agreed that Contractor shall perform all Extra Work under the direction of the Owner when presented with a Written Work Order signed by the Owner: subject, however, to the right of Contractor to require a written confirmation of such Extra Work Order by the County Commissioners' Court. It is also agreed that the compensation to be paid Contractor for performing said Extra Work shall be determined by one or more of the following methods:

Method (a) - By agreed unit prices; or
Method (b) - By agreed lump sum: or
Method (c) - If Neither Method (a) nor Method (b) can be agreed upon before the Extra Work is commenced, then Contractor shall be paid the "Actual field cost" of the work plus fifteen (15) percent.

In the event said Extra Work be performed and paid for under Method (c), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost of all workmen, such as foremen, timekeepers, merchants, and laborers, and materials, supplies, teams, trucks, rentals on machinery and equipment for time actually employed or used on such Extra Work plus actual transportation charges necessarily incurred, if the kind of equipment or machinery is not already on the job, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work including Social Security, Old Age Benefits and other payroll taxes, and a ratable proportion of premiums on Construction and Maintenance Bonds, Public Liability and Property Damage and Workmen's Compensation, and all other insurance as may be required by any law or ordinance, or directed by the Owner or by him agreed. The Owner may direct the form in which accounts of the "actual field cost" shall be kept and may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used, otherwise these matters shall be determined by Contractor. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using the one hundred (100) percent of the actual hourly or daily rate (for the time used plus time in moving to and from Job) of the latest schedule of Equipment Ownership Expense adopted by the Association General Contractors of America. Where practicable the terms and prices for the use of Machinery and Equipment shall be incorporated in the Written Extra Work Order. The fifteen (15) percent of the "Actual Field Cost" to be paid Contractor shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the 'actual field cost" as herein defined, save that where the Contractor's Camp or Field Office must be maintained primarily on account of such extra work, then the cost to maintain and operate same shall be included in the "actual field cost".

No claim for extra work of any kind will be allowed unless ordered in writing by the Owner. In case any orders or instructions, either oral or written appear to Contractor to involve extra work for which he should receive compensation, it shall make written request to the Program Administrator for written order authorizing Extra Work. Should a difference of opinion arise as to what does or does not constitute extra work, or as to the payment therefor, and the Owner insists upon its performance, Contractor shall proceed with the work after making written order and shall keep an

accurate account of the "actual field cost" thereof, as provided under Method (c) and by this action Contractor will thereby preserve the right to submit the matter of payment to litigation.

(d) Each change order shall include in its final form:

1) A detailed description of the change in the work.

2) The Contractor's proposal (if any) or a confirmed copy thereof.

3) A definite statement as to the resulting change in the contract price and/or time.

4) The statement that all work involved in the change shall be performed in accordance with contract requirements except as modified by the change order.

5) The procedures as outlined in this Section for a unit price contract also apply in any lump sum contract.

9. Claims for Extra Cost

(a) If the Contractor claims that any instructions by Drawings or otherwise involve extra cost or extension of time, he shall, within ten days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the Owner, stating clearly and in detail the basis of his objections. No such claim will be considered unless so made.

(b) Claims for additional compensation for extra work, due to alleged errors in ground elevations, contour lines, or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material, or performing more work, than would be reasonably estimated from the Drawings and maps issued.

(c) Any discrepancies which may be discovered between actual conditions and those represented by the Drawings and maps shall be reported at once to the Owner and work shall not proceed except at the Contractor's risk, until written instructions have been received by him from the Owner.

(d) If, on the basis of the available evidence, the Owner determines that an adjustment of the Contract Price and/or time is justifiable, a change order shall be executed.

10. Liquated Damages

If the work is not completed within the time stipulated in the applicable bid for Lump Sum or Unit Price Contract provided, the Contractor shall pay to the Owner as fixed, agreed, and liquidated damages (it being impossible to determine the actual damages occasioned by the delay) the amount of *One Thousand* dollars ($*1,000.00*) or each calendar day of delay, until the work is completed. The Contractor and his sureties shall be liable to the Owner for the amount thereof.

11. Disputes

(a) All disputes arising under this Contract or its interpretation except those disputes covered by FEDERAL LABOR STANDARDS PROVISIONS whether involving law or fact or both, or extra work, and all claims for alleged breach of contract shall, within ten (10) days of commencement of the dispute, be presented by the Contractor to the Owner for decision. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its

commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt of the Owner.

(b) The Contractor shall submit in detail his claim and his proof thereof.

(c) If the Contractor does not agree with any decision of the Owner, he shall in no case allow the dispute to delay the work but shall notify the Owner promptly that he is proceeding with the work under protest.

12. Technical Specifications and Drawings

Anything mentioned in the Technical Specifications and not shown on the Drawings or vice versa, shall be of like effect as if shown on or mentioned in both. In case of difference between Drawings and Technical Specifications, the Technical Specifications shall govern. In case of any discrepancy in Drawings, or Technical Specifications, the matter shall be immediately submitted to the Owner, without whose decision, said discrepancy shall not be adjusted by the Contractor, save only at his own risk and expense.

13. Shop Drawings

(a) All required shop drawings, machinery details, layout drawings, etc. shall be submitted to the Engineer in 6 copies for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting and rechecking if necessary. The Contractor may proceed, only at his own risk, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved and no claim, by the Contractor, for extension of the contract time shall be granted by reason of his failure in this respect.

(b) Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of contract price and/or time, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though the drawings have been approved.

(c) If a shop drawing is in accordance with the contract or involves only a minor adjustment in the interest of the Owner not involving a change in contract price or time; the engineer may approve the drawing. The approval shall not relieve the Contractor from his responsibility for adherence to the contract or for any error in the drawing.

14. Requests for Supplementary Information

It shall be the responsibility of the Contractor to make timely requests of the Owner for any additional information not already in his possession which should be furnished by the Owner under the terms of this Contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need approaches, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the Contractor. The first list shall be submitted within two weeks after Contract award and shall be as complete as possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the Contractor. The Contractor shall be

fully responsible for any delay in his work or to others arising from his failure to comply fully with the provision of this section.

15. Materials and Workmanship

(a) Unless otherwise specifically provided for in the technical specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the technical specifications as "equal to" any particular standard, the Engineer shall decide the question of equality.

(b) The Contractor shall furnish to the Owner for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required, and shall likewise submit for approval full information concerning all other materials or articles which he proposes to incorporate.

(c) Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at the risk of subsequent rejection.

(d) Materials specified by reference to the number or symbol of a specific standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade, or modified in the technical specifications shall have full force and effect as though printed therein.

(e) The Owner may require the Contractor to dismiss from the work such employee or employees as the Owner or the Engineer may deem incompetent, or careless, or insubordinate.

16. Samples, Certificates and Tests

(a) The Contractor shall submit all material or equipment samples, certificates, affidavits, etc., as called for in the contract documents or required by the Engineer, promptly after award of the contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.

(b) Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in making a prompt decision regarding the acceptability of the sample. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.

(c) Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with Contract requirements. After actual deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and

replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.

(d) Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:

1) The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes, except those samples taken on the project by the Engineer;

2) The Contractor shall assume all costs of re-testing materials which fail to meet contract requirements;

3) The Contractor shall assume all costs of testing materials offered in substitution for those found deficient;

4) The Owner will pay all other expenses.

17. Permits and Codes

(a) The Contractor shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers. Before installing any work, the Contractor shall examine the drawings and technical specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the Owner. Where the requirements of the drawings and technical specifications fail to comply with such applicable ordinances or codes, the Owner will adjust the Contract by Change Order to conform to such ordinances or codes (unless waivers in writing covering the difference have been granted by the governing body or department) and make appropriate adjustment in the Contract Price or stipulated unit prices.

(b) Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility at variance with any applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the drawings and technical specifications), the Contractor shall remove such work without cost to the Owner.

(c) The Contractor shall at his own expense, secure and pay for all permits for street pavement, sidewalks, shed, removal of abandoned water taps, sealing of house connection drains, pavement cuts, buildings, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.

(d) The Contractor shall comply with applicable local laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespass on any public or private property in any operation due to or connected with the Improvements contained in this Contract.

(e) The Contractor will be required to make arrangements for and pay the water, electrical power, or any other utilities required during construction.

(f) During construction of this project, the Contractor shall use every means possible to control the amount of dust created by construction. Prior to the close of a day's work, the Contractor, if directed by the Owner, shall moisten the bank and surrounding area to prevent a dusty condition.

18. Care of Work

(a) The Contractor shall be responsible for all damages to person or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance.

(b) The Contractor shall provide sufficient competent watchmen, both day and night, including Saturdays, Sundays, and holidays, from the time the work is commenced until final completion and acceptance.

(c) In an emergency affecting the safety of life, limb or property, including adjoining property, the Contractor, without special instructions or authorization from the Owner is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by the Owner.

(d) The Contractor shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc., and he shall at his own expense completely repair any damage thereto caused by his operations.

(e) The Contractor shall shore up, brace, underpin, secure, and protect as maybe necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements included in this Contract. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which the Owner may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

19. Accident Prevention

(a) No laborer or mechanic employed in the performance of this Contract shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety as determined under construction safety and health standards promulgated by the Secretary of Labor.

(b) The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work.

(c) The Contractor shall maintain an accurate record of all cases of death, occupational disease, or injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Owner with reports concerning these matters.

(d) The Contractor shall indemnify and save harmless the Owner from any claims for damages resulting from property damage, personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this contract.

(e) The Contractor shall provide trench safety for all excavations more than five feet deep prior to excavation. All OSHA Standards for trench safety must be adhered to by the Contractor.

(f) The contractor shall at all times conduct his work in such a manner as to insure the least possible inconvenience to vehicular and pedestrian traffic. At the close of the work each day, all streets where possible in the opinion of the Owner, shall be opened to the public in order that persons living in the area may have access to their homes or businesses by the use of the streets. Barricades, warning signs, and necessary lighting shall be provided to the satisfaction of the Owner at the expense of the Contractor.

20. Sanitary Facilities

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations.

21. Use of Premises

(a) The Contractor shall confine his equipment, storage of materials, and construction operations to the contract limits as shown on the drawings and as prescribed by ordinances or permits, or as may be desired by the Owner, and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.

(b) The Contractor shall comply with all reasonable instructions of the Owner and all existing state and local regulations regarding signs, advertising, traffic, fires, explosives, danger signals, and barricades.

22. Removal of Debris, Cleaning, Etc.

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights of way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for work, and put the whole site of the work and public rights of way in a neat and clean condition.

23. Inspection

(a) All materials and workmanship shall be subject to inspection, examination, or test by the Owner and Engineer at any and all times during manufacture or construction and at any and all places where such manufacture or construction occurs. The Owner shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge. If the Contractor fails to proceed at once with the correction of rejected workmanship or defective material, the Owner may by contract or otherwise have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any Monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

(b) The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the Owner will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the technical specifications.

(c) The Contractor shall notify the Owner sufficiently in advance of back filling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the Owner, the Contractor shall uncover for inspection and recover such facilities at his own expense, when so requested by the Owner.

(d) Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

(e) Inspection of materials and appurtenances to be incorporated in the improvements included in this Contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such inspection and acceptance, unless otherwise stated in the technical specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.

(f) Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the Owner or its agents shall relieve the Contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

24. Review by Owner

The Owner and its authorized representatives and agents shall 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, provided, however that all instructions and approval with respect to the work will be given to the Contractor only by the Owner through its authorized representatives or agents.

25. Final Inspection

When the Improvements included in this Contract are substantially completed, the Contractor shall notify the Owner in writing that the work will be ready for final inspection on a definite date which shall be stated in the notice. The Owner will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable.

26. Deduction for Uncorrected Work

If the Owner deems it not expedient to require the Contractor to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the Contractor and the Owner and subject to settlement, in case of dispute, as herein provided.

27. Warranty of Title

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which

an interest is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed by him to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm, or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

28. Warranty of Workmanship and Materials

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements included in this Contract by the Owner or the public shall constitute an acceptance of work

not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of __12____ months from the date of final acceptance of the work.

29. Compliance with Air and Water Acts

(a) In compliance with the Clean Air Act, as amended, 41 U.S.C. Sec. 7401 et. seq., and the regulations of the Environmental Protection Agency with respect thereto, the Contractor agrees that:

1) Any facility to be utilized in the performance of this contract or any subcontract shall not be a facility listed on the EPA List of Violating Facilities pursuant to 40 CFR 15.20.

2) He will comply with all requirements of Section 114 of the Clean Air Act, as amended.

3) Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in the specifications.

(b) 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 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.

30. Section 109 of the Housing and Community Development Act of 1974

No person in the United States shall on the ground of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

31. The Provision of Local Training, Employment, and Business Opportunities

(a) To the greatest extent feasible opportunities for training and employment be given lower income residents of the project area and contracts for work in connection with the project be awarded to

business concerns which are located in, or owned in substantial part by persons residing in the area of the project.

(b) The Contractor will include this clause in every subcontract for work in connection with the project.

32. Non Segregated Facilities

The Contractor certifies that he does not and will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not and will not permit his employees any segregated facilities at any of his establishments, or permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. As used in this paragraph the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

33. Job Offices

(a) The Contractor and his subcontractors may maintain such office and storage facilities on the site as are necessary for the proper conduct of the work. These shall be located so as to cause no interference to any work to be performed on the site. The Owner shall be consulted with regard to locations.

(b) Upon completion of the improvements, or as directed by the Owner, the Contractors shall remove all such temporary structures and facilities from the site, and leave the site of the work in the condition required by the Contract.

34. Partial Use of Site Improvements

The Owner may give notice to the Contractor and place in use those sections of the improvements which have been completed, inspected and can be accepted as complying with the technical specifications and if in its opinion, each such section is reasonably safe, fit, and convenient for the use and accommodation for which it was intended, provided:

(a) The use of such sections of the Improvements shall in no way impede the completion of the remainder of the work by the Contractor.

(b) The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.

(c) The period of guarantee stipulated in the Section 29 hereof shall not begin to run until the date of the final acceptance of all work which the Contractor is required to construct under this Contract.

Disaster Recovery Projects

Attention is called to the fact that not less than, the federally determined prevailing (Davis-Bacon and Related Acts) wage rate, and contained in the contract documents, must be paid on this project. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex age or national origin.

All contractors/subcontractors that are debarred, suspended or otherwise excluded from or ineligible for participation on federal assistance programs may not undertake any activity in part or in full under this project.

Funding for this project is covered under Section 3 of the Housing and Urban Development Act of 1968. All eligible bidders must comply with Section 3 requirements in regards to meeting or exceeding the required objectives for both hiring and subcontracting. In accordance with these objectives, contractors are required to direct their newly created employment and/or subcontracting opportunities to Section 3 Residents and Business Concerns.

BID PROPOSAL

The bidder hereby proposes to furnish all labor, material, equipment and incidentals for:

Cowart Creek Tributary Two

Enclosed is a Cashier's Check or Bid Bond in the sum of 5% of the greatest amount bid.

Bidder agrees to perform in accordance with the requirements of the contract documents in consideration of payment by the County of the prices in this proposal.

IN CASE OF DISCREPANCY BETWEEN UNIT PRICES AND EXTENDED PRICES, UNIT PRICES WILL GOVERN.

This bid sheet must be completely filled out in ink or typewritten with any necessary supplemental information attached.

The undersigned hereby agrees to all of the foregoing terms and provisions and to all terms and provisions of the contract, if awarded, which includes all provisions of Sections I - VI of this bid package.

BIDDER _____

SIGNATURE _____

PRINT NAME _____

TITLE _____

ADDRESS _____

CITY, STATE _____

ZIP _____

TELEPHONE _____

FAX NO _____

DATE _____

TAX I.D. No. _____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
PROJECT MOBILIZATION					
1)	1	LS	MOBILIZATION - INCLUDING ALL PERMITS Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
2)	1	LS	PERFORMANCE, PAYMENT, AND MAINTENANCE BONDS Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
			SUBTOTAL PROJECT MOBILIZATION Items 1-2		**$_____**

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
SITE PREPARATION					
1)	2.1	AC	SITE PREPARATION INCLUDING CLEARING, GRUBBING, TREE REMOVAL, AND DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Acre	$_____	$_____
2)	393	LF	REMOVAL OF EXISTING FENCE INCLUDING DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
3)	1	LS	REMOVAL OF EXISTING HEADWALL ON 6' X 4' BOX CULVERT INCLUDING DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
4)	78	SY	REMOVAL OF EXISTING ASPHALT STREET PAVING INCLUDING DISPOAL OF ALL MATERIAL AND TRAFFIC CONTROL Complete in Place @ _____ _____ Per Square Yard	$_____	$_____
5)	67	SY	REMOVAL OF CONCRETE STREET PAVING INCLUDING DISPOAL OF ALL MATERIAL AND TRAFFIC CONTROL Complete in Place @ _____ _____ Per Square Yard	$_____	$_____
6)	30	LF	REMOVAL OF EXIST. 24-INCH STORM INCLUDING DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
7)	1	LS	REMOVAL OF EXISTING BUILDING INCLUDING DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
8)	1	EA	REMOVAL OF EXIST. STORM MANHOLE INCLUDING DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Each	$_____	$_____
			SUBTOTAL SITE PREPARATION Items 1-8		**$_____**

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
WATERLINE IMPROVEMENTS					
1)	2	LS	ADJUSTMENT OF EXISTING 8-INCH WATERLINE PER CITY OF FRIENDSWOOD REQUIREMENT INCLUDING BEDDING AND BACKFILL AND REMOVAL AND DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
2)	1	LS	CONSTRUCT STEEL SPLIT CASING ON EXISTING 16-INCH WATERLINE PER CITY OF FRIENDSWOOD REQUIREMENTS INCLUDING BEDDING AND BACKFILL AND REMOVAL AND DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
3)	1	LS	TRENCH SAFETY FOR ALL WATERLINE RELOCATION AND REPAIRS Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
			SUBTOTAL WATERLINE IMPROVEMENTS Items 1-3		**$**_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
SANITARY SEWER IMPROVEMENTS					
1)	2	LS	CONSTRUCT STEEL SPLIT CASING ON EXISTING 8-INCH SANITARY SEWER PER CITY OF FRIENDSWOOD REQUIREMENTS INCLUDING BEDDING AND BACKFILL AND REMOVAL AND DISPOSAL OF ALL MATERIAL Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
2)	1	LS	TRENCH SAFETY FOR ALL SANITARY SEWER RELOCATION AND REPAIRS Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
			SUBTOTAL SANITARY SEWER IMPROVEMENTS Items 1-2		**$_____**

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
DRAINAGE IMPROVEMENTS					
1)	1	LS	TIE 15-INCH STORM TO MANHOLE Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
2)	1	LS	ADJUST 18-INCH STORM AND TIE TO JUNCTION BOX Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
3)	427	LF	24-INCH REINFORCED CONCRETE PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
4)	1	LS	TIE 24-INCH STORM TO JUNCTION BOX Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____
5)	29	LF	30-INCH REINFORCED CONCRETE PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
6)	36	LF	5' X 3' REINFORCED CONCRETE BOX PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
7)	1,254	LF	6' X 6' REINFORCED CONCRETE BOX PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
8)	2	EA	6' X 6' REINFORCED CONCRETE 45 DEG. BENDS INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____
9)	1,326	LF	8' X 6' REINFORCED CONCRETE BOX PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
10)	768	LF	8' X 8' REINFORCED CONCRETE BOX PIPE INCLUDING ALL BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
11)	8	EA	TYPE "E" INLET TOP ON BOX PIPE Complete in Place @ _____ _____ Per Each	$_____	$_____
12)	2	EA	TYPE "A" INLET TOP ON BOX PIPE Complete in Place @ _____ _____ Per Each	$_____	$_____
13)	1	EA	TYPE "C" MANHOLE FOR 24-INCH TO 48-INCH PIPE (0' - 8' DEPTH) INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____
14)	1	EA	TYPE "C" MANHOLE FOR 24-INCH TO 48-INCH PIPE (0' - 8' DEPTH) WITH TYPE "E" INLET TOP INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS		

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
			Complete in Place @ _____ _____ Per Each	$_____	$_____
15)	4	EA	OVERSIZED JUNCTION BOX (ALL DEPTHS) WITH TYPE "C" MANHOLE TOP INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____
16)	4	EA	OVERSIZED JUNCTION BOX (ALL DEPTHS) WITH TYPE "E" INLET TOP INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
17)	3	EA	TIE 24-INCH STORM TO JUNCTION BOX INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____
18)	1	EA	TIE 30-INCH STORM TO JUNCTION BOX INCLUDING BEDDING AND BACKFILL AND DISPOSAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Each	$_____	$_____
19)	1	LS	SLOPE PAVING ON 8' X 8" BOX PIPE OUTFALL AS PER GCCDD DETAILS AND REQUIREMENTS. INCLUDES ALL PREPARATION INSTALLATION OF PAVING AND TOE WALLS AND REMOVAL OF EXCAVATION SPOILS Complete in Place @ _____ _____ Per Lump Sum	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
20)	2	EA	BRICK PLUG ON 6' X 4' BOX PIPE Complete in Place @ _____ _____ Per Each	$_____	$_____
21)	3,101	LF	SURFACE SWALE ON TOP OF PROPOSED BOX PIPE INCLUDING DISPOSAL OF ALL EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
22)	210	LF	REGRADE EXISTING DITCH INCLUDING DISPOSAL OF ALL EXCAVATION SPOILS Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
23)	3,453	LF	TRENCH SAFETY Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
			SUBTOTAL DRAINAGE IMPROVEMENTS Items 1-23		**$_____**

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
MISCELLANEOUS ITEMS					
1)	393	LF	NEW FENCE AS REQUIRED TO REPLACE REMOVED FENCE. FENCE TYPE TO BE MATCH EXISTING. Complete in Place @ _____ _____ Per Linear Foot	$_____	$_____
2)	78	SY	ASPHALT PAVING TO REPLACE THE REMOVED PAVING. INCLUDES ALL PREPARATION, STABILIZATION, AND MATERIALS AND TRAFFIC CONTROL Complete in Place @ _____ _____ Per Square Yard	$_____	$_____
3)	67	SY	CONCRETE PAVING TO REPLACE THE REMOVED PAVING. INCLUDES ALL PREPARATION, STABILIZATION, AND MATERIALS AND TRAFFIC CONTROL Complete in Place @ _____ _____ Per Square Yard	$_____	$_____
			SUBTOTAL MISCELLANEOUS ITEMS Items 1-3		**$**_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
POLLUTION PREVENTION					
1)	5	EA	REINFORCED FILTER FABRIC BARRIER AS PER THE CONSTRUCTION DETAILS INCLUDING REMOVAL AND DISPOSAL Complete in Place @ _____ _____ Per Each	$_____	$_____
2)	18	EA	INLET PROTECTION BARRIER AS PER THE CONSTRUCTION DETAILS INCLUDING REMOVAL AND DISPOSAL Complete in Place @ _____ _____ Per Each	$_____	$_____
3)	3	EA	STABILIZED CONSTRUCTION ENTRANCE AS PER THE CONSTRUCTION DETAILS INCLUDING REMOVAL AND DISPOSAL Complete in Place @ _____ _____ Per Each	$_____	$_____

BID SCHEDULE FOR
COWART CREEK TRIBUTARY TWO TO SERVE
GALVESTON COUNTY, TEXAS
PROJECT NO. P21472-5

No.	Approx. Quantity	Unit	Description Of Item With Unit Price Written in Words	Unit Price	Total Amount Bid
4)	1	EA	CONCRETE TRUCK WASHOUT. INCLUDES REMOVAL AND DISPOSAL AT THE CONCLUSION OF CONSTRUCTION Complete in Place @ _____ _____ Per Each	$_____	$_____
5)	3.5	AC	HYDROMULCH SEEDING OF ALL DISTURBED AREAS. INCLUDES RE-APPLICATION AS REQUIRED FOR 90% GERMINATION Complete in Place @ _____ _____ Per Acre	$_____	$_____
			SUBTOTAL POLLUTION PREVENTION Items 1-5		**$_____**

BID SCHEDULE FOR COWART CREEK TRIBUATARY TWO
TO SERVE GALVESTON COUNTY
PROJECT NO: P21472-5

BID SUMMARY

SUBTOTAL PROJECT MOBILIZATION (ITEMS 1-2)	$_____
SUBTOTAL SITE PREPARATION (ITEMS 1-8)	$_____
SUBTOTAL WATERLINE IMPROVEMENTS (ITEMS 1-3)	$_____
SUBTOTAL SANITARY SEWER IMPROVEMENTS (ITEMS 1-2)	$_____
SUBTOTAL DRAINAGE IMPROVEMENTS (ITEMS 1-23)	$_____
SUBTOTAL MISCELLANEOUS ITEMS (ITEMS 1-3)	$_____
SUBTOTAL POLLUTION PREVENTION (ITEMS 1-5)	$_____
TOTAL OF ALL BID ITEMS	**$_____**

The undersigned bidder has carefully examined the Instruction to Bidders, this Proposal, the General Conditions of Agreement, the Technical Specifications, and the drawings for the work hereinabove described and referred to in the Invitation to Bid and has carefully examined the site of the work and will provide all necessary labor, superintendence, machinery, equipment, tools, materials, services and other means of construction to complete all of the work upon which he bids, as called for in the contract, the Specifications and shown on the drawings, and in the manner prescribed therein and According to the requirements of the Engineer as therein set for the amounts below:

The undersigned agrees to substantially complete all work within 270 calendar days. Furthermore, undersigned has read and understands Section 11 of the Instruction to Bidders regarding economic disincentive for late completion of the work.

The undersigned certifies that the bid prices contained in this proposal have been carefully checked and are submitted as correct and final.

Date:

Signed: _____

_____
(Print Name)

_____
(Title)

_____
Witness

_____
(Company Name)

_____

SEAL (if Bidder is a Corporation)

_____
(Address)

_____
(Phone)

Acknowledge receipt of Addenda Below:

Addendum No _____ _____ _____ _____

Date Received _____ _____ _____ _____

State of Texas Tax Statement of Materials and other charges:

The cost of in-place materials to be

incorporated into the project $_____

The cost of labor, profit, materials

not in-place and all other charges $_____

TOTAL: (Must agree with bid) $_____

BID #
OPEN DATE
TIME

CONTRACT AWARD

CONTRACT FOR: Cowart Creek Tributary Two

THIS CONTRACT IS ENTERED INTO BETWEEN GALVESTON COUNTY AND THE CONTRACTOR NAMED BELOW PURSUANT TO SUBCHAPTER B, CHAPTER 271, TEXAS LOCAL GOVERNMENT CODE, AND THE REFERENCED INVITATION TO BID.

Contract No: 13-465-000-7974

Bid No: 22801-1_Bid 4

Contractor: _____

The Specifications and Drawings are enumerated as follows:

Standard Specifications:

Special Provisions:

Special Items:

DRAWINGS: _____

ADDENDA: _____

Contract Award (continued)

Sections I (Invitation to Bid; General Provisions; Instructions to Bidders; Vendor Qualification Packet), II (Bid Proposal; Contract Award), III (Special Terms and Conditions, [including Addenda], Wage Rates & Affidavit and Surety Forms), IV (General Terms and Conditions), V (Specifications) and VI (Plans) attached to this Contract Award are all made a part of this Contract and collectively evidence and constitute the entire contract. Contractor shall furnish all materials, perform all of the work required to be done and do everything else required by these documents.

Time of Completion: The Contractor shall complete the work within xxxxx Calendar Days of the issuance of the notice to proceed. The time set forth for completion of the work is an essential element of the Contract.

The Contract Sum: The County shall pay the Contractor for performance of the Contract, the sum of _____ _____Dollars and No/100 ($_____), payments to be made as described herein.

Performance Bond required: (x) yes ( ) no
Payment Bond required: (x) yes ( ) no

This Contract is issued pursuant to award made by Commissioners' Court on _____, 20___.

EXECUTED this _____ day of _____, 20___.

COUNTY OF GALVESTON, TEXAS

BY: _____
MARK HENRY, County Judge

ATTEST:

_____
DWIGHT SULLIVAN, County Clerk

CONTRACTOR

_____

BY: _____
Signature - Title

_____
Printed Name

Federal Labor Standards Provisions

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage rate and fringe benefits therefore only when the following criteria have been met.

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140).

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140).

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

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

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of an laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140).

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract, in the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates or contributions or costs anticipated for bona fide fringe benefits or cash equivalents there of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017).

(ii)(a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-0014-1), U. S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149).

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

(1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

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

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

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

(4) Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration. Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. the ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or its designee may be appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

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

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

10. (i) Certification of Eligibility. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government

contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part "Whoever, for the purpose of ... influencing in any way the action of such Administration... makes, utters or publishes any statement, knowing the same to be false... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

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

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat.96).

(3) The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

BID #
OPEN DATE
TIME

CONTRACTOR'S LOCAL OPPORTUNITY PLAN

(name of company) _____ agrees to implement the following specific affirmative action steps directed at increasing the utilization of lower income residents and businesses within the City of Friendswood and Galveston County.

A. To ascertain from the Grant Recipient's CDBG program official the exact boundaries of the project area and where advantageous, seek the assistance of local officials in preparing and implementing the affirmative action plan.
B. To attempt to recruit from within the city the necessary number of lower income residents through: local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within and servicing the project area such as Service Employment and Redevelopment (SER), Opportunities Industrialization Center (OIC), Urban League, Concentrated Employment Program, Hometown Plan, or the U.S. Employment Service.
C. To maintain a list of all lower income residents who have applied either on their own or on referral from any source, and to employ such persons, if otherwise eligible and if a vacancy exists.
D. To insert this plan in all bid documents and to require all bidders on subcontracts to submit an affirmative action plan including utilization goals and the specific steps planned to accomplish these goals.
E. To insure that subcontracts (greater than $10,000), which are typically let on a negotiated rather than a bid basis in areas other than the covered project area, are also let on a negotiated basis, whenever feasible, in a covered project area.
F. To formally contact unions, subcontractors, and trade associations to secure their cooperation in this effort.
G. To insure that all appropriate project area business concerns are notified of pending sub-contractual opportunities.
H. To maintain records, including copies of correspondence, memoranda, etc., which document that all of the above affirmative action steps have been taken.
I. To appoint or recruit an executive official of the company or agency as Equal Opportunity Officer to coordinate the implementation of this plan.
J. To maintain records concerning the amount and number of contracts, subcontracts, and purchases which contribute to objectives.
K. To maintain records of all projected work force needs for all phases of the project by occupation, trade, skill level, and number of positions and to update these projections based on the extent to which hiring meets these Local Opportunity objectives.

As officers and representatives of_____(name of company)_____, we the undersigned have read and fully agree to this Plan, and become a party to the full implementation of the program and its provisions.

_____
Signature

_____ _____
Title Date

PROPOSED CONTRACTS BREAKDOWN

Type of Contracts	No. of Contracts	Approx. Total Dollar Amount	Estimated No. to local Business	Estimated $ Amount Local Business

ESTIMATED PROJECT WORKFORCE BREAKDOWN

Work Classifications	Total Estimated Positions	No. of Positions Currently Filled	No. of Positions not Filled	No. of Positions to fill with L/M Residents
Totals				

BID #
OPEN DATE
TIME

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

Name of Bidder:_____Date Organized:_____

Address:_____Date Incorporated_____

Number of Years in contracting business under present name_____:

CONTRACTS ON HAND:

Contract	Amount $	Completion Date

Type of work performed by your company: _____

Have you ever failed to complete any work awarded to you? _____
Have you ever defaulted on a contract?_____

List the projects most recently completed by your firm (include project of similar importance):

Project	Amount $	Mo/Yr Completed

Major equipment available for **this** contract: _____
_____
_____

Attach resume(s) for the principal member(s) of your organization, including the officers as well as the proposed superintendent for the project.

Credit available: $ _____ Bank reference: _____

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the _____ in verification of the recitals comprising this Statement of Bidder's Qualifications.

Executed this _____ day of _____, 19___.

By:(signature) _____ Title: _____

(print name) _____

Texas General Land Office
Community Development Block Grant (CDBG)
Disaster Recovery Program

SECTION 3
RESIDENT EMPLOYMENT OPPORTUNITY DATA
ELIGIBLITY FOR PREFERENCE

Economic Opportunities for Low and Very Low-Income Persons

Grantee/Subrecipient:	Contract Number:	Date:

ELIGIBILITY FOR PREFERENCE

A Section 3 Resident seeking the preference in training and employment provided by this part shall certify, or submit evidence to the Subrecipient, Grantee, Contractor or Subcontractor, if requested, that the person is a Section 3 Resident, as defined in Section CFR 135.5. (An example of evidence of eligibility for the preference is evidence of receipt of public assistance, or evidence of participation in a public assistance program.)

Section 3 Resident Certification
for Worker Seeking Preference in Training
and Employment

RESIDENT COMPLETES THIS SECTION:

I, _____, am a legal resident of the _____

_____ and meet the income eligibility guidelines for a low- or very-low-income person as published on HUD'S income limits www.huduser.org/portal/datasets/il.html and documented on the reverse side of this form.

My permanent address is: _____

_____

I have attached the following documentation as evidence of my status:

- ☐ Copy of Lease
- ☐ Copy of receipt of public assistance
- ☐ Copy of Evidence of participation in a public assistance program
- ☐ Other Evidence

_____ _____
Resident Signature Date

_____
Print Name

SECTION 3 INCOME LIMITS

All residents of public housing developments of the Housing Authority of

_____

Qualify as Section 3 Residents.
Alternatively, individuals residing in the
City of _____
or County of

Who meet the income limits set forth below, can also qualify for Section 3 status.

A picture identification card and proof that illustrates applicant is a current resident of the subject area.

HUD updates area median income (AMI) annually and income limits vary by county. To find the latest income limits visit HUD's website: www.huduser.org/portal/datasets/il.html

Eligibility Guideline

Number in Household	Very Low Income (50% AMI)	Low Income (80%)
1 Individual		
2 Individuals		
3 Individuals		
4 Individuals		
5 Individuals		
6 Individuals		
7 Individuals		
8 Individuals		

_____ _____
Signature Field Date

.

_____
Print Name

Texas General Land Office
Community Development Block Grant (CDBG)
Disaster Recovery Program

CERTIFICATION FOR BUSINESS CONCERNS
Seeking Section 3 Preference in Contracting and Demonstration of Capability

Economic Opportunities for Low and Very Low-Income Persons

Grantee/Subrecipient:	Contract Number:	Date:

CONTRACTOR INFORMATION

Name of Business _____

Address of Business _____

Type of Business: ☐ Corporation ☐ Partnership ☐ Non-Profit Consortium
☐ Sole Proprietorship ☐ Joint Venture

Attach the following documentation as evidence of Section 3 eligible status:
(Definition of "Section 3 Business Concern" in 24 CFR 135 describes the three alternative qualifications.)

For Business claiming status as a Section 3 resident-owned enterprise:

☐ Copy of resident lease
☐ Copy of evidence of participation in a public assistance program
☐ Copy of receipt of public assistance
☐ Other evidence _____

For business entity as applicable:

☐ Copy of Articles of Incorporation
☐ Assumed Business Name Certificate
☐ List of owners/stockholders and % ownership of each appointed officers
☐ Organization chart with names and titles and brief function statement
☐ Certificate of Good Standing
☐ Partnership Agreement
☐ Corporation Annual Report
☐ Latest Board minutes
☐ Additional documentation

For business entity claiming Section 3 status by subcontracting 25 percent of the dollar awarded to qualified Section 3 business(es):

☐ List of subcontracted Section 3 business(es) and subcontract amount

For business claiming Section 3 status, by claiming at least 30 percent of their workforce are currently Section 3 residents or were Section 3 eligible residents within 3 years of date of first employment with the business:

☐ List of all current full-time employees
☐ PHA/IHA Residential lease less than 3 years from day of employment
☐ List of employees claiming Section 3 status
☐ Other evidence of Section 3 status less than 3 years from date of employment

Evidence of ability to perform successfully under the terms and conditions of the proposed contract:

☐ Current financial statement
☐ List of owned equipment
☐ List of all contracts for the past two years
☐ Statement of ability to comply with public policy

_____ _____
Authorized Name and Signature Date

(Corporate Seal)

Attested By: _____

Grantee/Subrecipient: _____
Include this document in all applicable bid packets.

Texas General Land Office

Community Development Block Grant (CDBG)
Disaster Recovery Program

Contractor Certification of Efforts to Fully Comply with Employment and Training Provisions of Section 3

Economic Opportunities for Low and Very Low-Income Persons

THE BIDDER REPRESENTS AND CERTIFIES AS PART OF ITS BID/OFFER THAT IT:

☐	Is a Section 3 Business Concern. A Section 3 Business Concern means a business concern: 1. That is 51% or more owned by Section 3 Resident(s); or 2. Whose permanent, full-time employees include persons, at least 30% of whom are currently Section 3 Residents, or 3. That provides evidence of a commitment to subcontract in excess of 25% of the dollar value of all subcontracts to be awarded to Section 3 Business Concerns, that meet the qualifications set forth in paragraphs 1 or 2 herein.
☐	Is **NOT** a Section 3 Business Concern, but who has and will continue to seek compliance with Section 3 by certifying the following efforts to be undertaken.
	EFFORTS TO AWARD SUBCONTRACTOR TO SECTION 3 CONCERNS **(Check ALL that apply)**
☐	By contacting business assistance agencies, minority contractors associations and community organizations to inform them of the contracting opportunities and requesting their assistance in identifying Section 3 businesses which may solicit bids for a portion of the work.
☐	By advertising contracting opportunities by posting notices, which provide general information about the work to be contracted and where to obtain additional information, in the common areas of the applicable development(s) owned and managed by the Housing Authority.
☐	By providing written notice to all known Section 3 Business Concerns of contracting opportunities. This notice should be in sufficient time to allow the Section 3 Business Concerns to respond to bid invitations
☐	By following up with Section 3 Business Concerns that have expressed interest in the contracting opportunities.
☐	By coordinating meetings at which Section 3 Business Concerns could be informed of specific elements of the work for which subcontract bids are being sought.
☐	By conducting workshops on contracting procedures and specific contracting opportunities in a timely manner so that Section 3 Business Concerns can take advantage of contracting opportunities.
☐	By advising Section 3 Business Concerns as to where to seek assistance to overcome barriers such as inability to obtain bondi ng, lines of credit, financing, or insurance and aiding Section 3 Businesses in qualifying for such bonding , financing, insurance, etc....
☐	Where appropriate, by breaking out contract work into economically feasible units to facilitate participation by Section 3 businesses.
☐	By developing and using a list of eligible Section 3 Business Concerns.
☐	By actively supporting and undertaking joint ventures with Section 3 Businesses.
	EFFORTS TO PROVIDE TRAINING AND EMPLOYMENT TO SECTION 3 RESIDENTS
☐	By entering into a "first source" hiring agreements with organizations representing Section 3 Residents.
☐	By establishing training programs, which are consistent with the requirements of the Department of Labor, specifically for Section 3 Residents in the building trades.
☐	By advertising employment and training positions to dwelling units occupied by Category 1 and 2 residents.
☐	By contacting resident councils and other resident organizations in the affected housing development to request assistance in notifying residents of the training and employment positions to be filled.
☐	By arranging interviews and conducting interviews on the job site.
☐	By undertaking such continued job-training efforts as may be necessary to ensure the continued employment of Section 3 Residents previously hired for employment opportunities.
☐	By posting job vacancies in Work-In-Texas or with my local Workforce Solutions Center.

Contractor Name/Business Name: **Date:**

Authorized Representative Name:

Signature:

Code of Federal Regulations
Title 24- Housing and Urban Development

Volume: 1
Date: 2003-04-01
Original Date: 2003-04-01
Title: Section 135.38- Section 3 Clause
Context: Title 24- Housing and Urban Development. Subtitle B- Relating to Housing and Urban Development . Chapter 1- Office of Assistant Secretary for Equal Opportunity, Department. Part 135 Economic Opportunities for Low-and Very Low-Income Persons. Subpart B- Economic Opportunities for Section 3 Residents and Section 3 Business Concerns.

§ 135.38 Section 3 clause.

All section 3 covered contracts shall include the following clause (referred to as the section 3 clause):

A. The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

CONTRACTOR CERTIFICATIONS

U.S. Department of Housing and Urban Development

CERTIFICATION OF BIDDER REGARDING CIVIL RIGHTS LAWS AND REGULATIONS

INSTRUCTIONS

CERTIFICATION OF BIDDER REGARDING Executive Order 11246 and Federal Laws Requiring Federal Contractor to adopt and abide by equal employment opportunity and affirmative action in their hiring, firing, and promotion practices. This includes practices related to race, color, gender, religion, national origin, disability, and veterans' rights.

NAME AND ADDRESS OF BIDDER (include ZIP Code)

CERTIFICATION BY BIDDER

Bidder has participated in a previous contract or subcontract subject to Civil Rights Laws and Regulations.

☐ Yes ☐ No

The undersigned hereby certifies that:

☐ The Provision of Local Training, Employment, and Business Opportunities clause (Section 3 provision) is included in the Contract. A written Section 3 plan (Local Opportunity Plan) was prepared and submitted as part of the bid proceedings (if bid equals or exceeds $100,000).

☐ The Non Segregated Facilities clause (Section 109 provision) is included in the Contract. No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

☐ The Equal Employment Opportunity clause is included in the Contract (if bid equals or exceeds $10,000).

☐ The Affirmative Action for Handicapped Workers clause is included in the contract.

Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended?

☐ Yes ☐ No

NAME AND TITLE OF SIGNER (Please type)

SIGNATURE DATE

SECTION 504 CERTIFICATION

POLICY OF NONDISCRIMINATION ON THE BASIS OF DISABILITY

The _____ does not discriminate on the basis of disability in the admission or access to, or treatment or employment in, its federally assisted programs or activities.

(Name) _____

(Address) _____

_____
City State Zip

Telephone Number ( ) _____ - _____ Voice
( ) _____ - _____ TDD

has been designated to coordinate compliance with the nondiscrimination requirements contained in the Department of Housing and Urban Development's (HUD) regulations implementing Section 504 (24 CFR Part 8. dated June 2, 1988).

BID #
OPEN DATE
TIME

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM
CONTRACTOR'S CERTIFICATION

CONCERNING LABOR STANDARDS AND PREVAILING WAGE REQUIREMENTS

TO (appropriate recipient)	DATE
	PROJECT NUMBER (if any)
C/O	PROJECT NAME

1. The undersigned, having executed a contract with _____ _____ for the construction of the above-identified project, acknowledges that:

   (a) The Labor Standards provisions are included in the aforesaid contract,

   (b) Correction of any infractions of the aforesaid conditions, including infractions by any of his subcontractors and any lower tier subcontractors, is his responsibility.

2. He certifies that:

   (a) Neither he nor any firm, partnership or association in which he has substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6(b) of the Regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5) or pursuant to Section 3(a) of the Davis-Bacon Act, as amended.

   (b) No part of the aforementioned contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation, partnership or association in which such subcontractor has a substantial interest is designated as an ineligible contractor pursuant to any of the aforementioned regulatory or statutory provisions.

3. He agrees to obtain and forward to the aforementioned recipient within ten days after the execution of any subcontract, including those executed by his subcontractors and any lower tier subcontractors, a Subcontractor's Certification Concerning Labor Standards and Prevailing Wage Requirements executed by the subcontractors.

4. He certifies that:

   (a) The legal name and the business address of the undersigned are:

   (b) The undersigned is:

(1) A SINGLE PROPRIETORSHIP	(3) A CORPORATION ORGANIZED IN THE STATE OF
(2) A PARTNERSHIP	(4) OTHER ORGANIZATION (Describe)

   (c) The name, title and address of the owner, partners or officers of the undersigned are:

NAME	TITLE	ADDRESS

   (d) The names and addresses of all other persons having a substantial interest in the undersigned, and the nature of the interest are:

NAME	ADDRESS	NATURE OF INTEREST

(e) The names, addresses and trade classifications of all other building construction contractors in which the undersigned has a substantial interest are:

NAME	ADDRESS	TRADE CLASSIFICATION

_____
(Contractor)

Date _____

By _____

NONCOLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)

County of _____)

_____, being first duly sworn, deposes and says that:

(1) He is _____ of _____, the Bidder that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with another Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix an overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Friendswood, Galveston County, or Galveston County Consolidated Drainage District or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed) _____

_____
Title

Subscribed and sworn to me this _____ day of _____.

By: _____
Notary Public

My commission expires _____

BID #
OPEN DATE
TIME

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____ as PRINCIPAL, and _____, as SURETY are held and firmly bound unto _____ hereinafter called the "Owner", in the penal sum of _____ Dollars, ($_____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the Accompanying Bid, dated _____, for _____

NOW, THEREFOR, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within thirty (30) days after the said opening, and shall within the period specified therefor, or if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner in accordance with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said Bid and the amount for which the local Public Agency may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS THEREOF, the above-bounded parties have executed this instrument under their several seals this _____ day of _____, the name and corporate seal of each corporate party being hereto affixed and these present signed by its undersigned representative, pursuant to authority of its governing body.

(SEAL)

_____

(SEAL)

Attest: By: _____

Affix Corporate Seal

Attest: By: _____

Affix Corporate Seal

Attest: By: _____

Countersigned

By _____

* Attorney-in-Fact, State of _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____,_____, Secretary of the Corporation named as Principal in the within bond; that _____, who signed the said bond on behalf of the Principal was then _____ of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested to, for and in behalf of said corporation by authority of this governing body.

Corporate
Seal

Title: _____

* Power-of-attorney for person signing for surety company must be attached to bond.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor or Company)

_____
(Address)

a _____, hereinafter called Principal,
(Corporation / Partnership)

and _____
(Name of Surety Company)

_____
(Address)
hereinafter called Surety, are held and firmly bound unto

_____
(Name of Recipient)

_____
(Recipient's Address)

hereinafter called OWNER, in the penal sum of $ _____

Dollars, $ _____ in lawful money of the United States, for this payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONFIDENTIALITY OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, a copy of which is hereto attached and made a part hereof for the construction of:

_____
(Project Name)
_____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUB-CONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUB-CONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its

obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counter-parts, each on of
(Number)
which shall be deemed an original, this the _____ day of _____.

ATTEST: _____
(Principal)

_____ By _____ (s)
(Principal Secretary)

(SEAL)

_____
(Witness as to Principal) (Address)

_____ _____
(Address)

ATTEST: _____
(Surety)

_____ By _____
(Witness as to Surety) (Attorney in Fact)

_____ _____
(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor or Company)

_____
(Address)

a _____ hereinafter called Principal, and

_____
(Name of Surety Company

_____
(Address)

hereinafter called Surety, are held and firmly bound unto

_____
(Name of Recipient)

_____
(Recipient's Address)

hereinafter called OWNER, in the penal sum of $ _____Dollars ($ ____) in lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, successors, and assigns, jointly and severally, firmly in these presents.

THE CONDITION OF THIS OBBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER dated the _____ day of _____, a copy of which is hereto attached and made a part hereof for the construction of:

_____
_____
_____

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties in all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

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

ATTEST: _____
(Principal)

_____ By _____(s)
(Principal Secretary)

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____

ATTEST: _____
(Surety)

_____ By _____
(Witness as to Surety) (Attorney in Fact)

_____ _____
(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

ATTORNEY'S REVIEW CERTIFICATION

I, the undersigned, _____, the duly authorized and acting legal representative of the _____, do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and am of the opinion that each of the agreements may be duly executed by the proper parties, acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties; and that the agreements shall constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Attorney's signature: _____ Date: _____

Print Attorney's Name: _____

SECTION IV

Project Scope
General Notes

PROJECT SCOPE

Tributary Two is an existing drainage which begins at FM-2351 and ends at the main stem of Cowart Creek. The ditch is maintained by Galveston County Consolidated Drainage District however it also falls within the jurisdiction of the City of Friendswood and Galveston County.

The existing ditch in its current configuration is very difficult to maintain. As a result, the ditch has difficulty serving the drainage needs of the area.

This project proposes to replace the ditch with new underground box culverts from FM-2351 to Cowart Creek. The upstream end of the project is near the intersection of FM-2351 and Stadium Lane. A surface swale will be placed on top of the majority of the box culverts to collect storm water that currently shed to the ditch.

The first section of the improvements from FM-2351 to West Shadowbend Drive will include box culvert placed in the location of the existing ditch. The remainder of the box culvert for the project will follow a new, more direct route to Cowart Creek. The remainder of the ditch between West Shadowbend Drive and Cowart Creek will remain in place.

The jurisdictions having authority over this project include Galveston County Consolidate Drainage District, the City of Friendswood, and Galveston County. All construction for this project shall meet or exceed the requirements of those agencies.

SECTION V

Project Specifications

PRELIMINARY ESTIMATE
GLO CONTRACT NO. 13-465-000-7974
WORK ORDER NO. 7975
GLO BID PACKAGE NO. 22801-1_Bid 4
PROJECT NO. P21472-5 Cowart Creek Tributary Two

NO.	CONSTRUCTION ITEM	QTY	UNITS	UNIT PRICE	TOTAL PRICE
1	Mobilization	1	LS	$ 120,000.00	$ 120,000.00
2	Permitting	1	LS	$ 30,000.00	$ 30,000.00
1	Clearing and Grubbing	2.1	AC	$ 7,000.00	$ 14,700.00
2	Remove Fence	393	LF	$ 15.00	$ 5,895.00
3	Remove Concrete Headwalls	1	LS	$ 10,000.00	$ 10,000.00
4	Remove Asphalt Paving	78	SY	$ 25.00	$ 1,950.00
5	Remove Concrete Paving	67	SY	$ 40.00	$ 2,680.00
6	Remove 24-inch Storm	30	LF	$ 40.00	$ 1,200.00
7	Remove Exist. Building	1	LS	$ 7,500.00	$ 7,500.00
8	Remove Exist. Storm Manhole	1	EA	$ 3,000.00	$ 3,000.00
1	Adjust 8-inch Waterline	2	LS	$ 6,000.00	$ 12,000.00
2	Steel Casing for Exist. 16-inch Waterline	1	LS	$ 8,000.00	$ 8,000.00
3	Trench Safety for Waterline Repairs	1	LS	$ 5,000.00	$ 5,000.00
1	Steel Casing for Exist. 8-inch Sewer	2	LS	$ 4,000.00	$ 8,000.00
2	Trench Safety for Sewer Repairs	1	LS	$ 2,500.00	$ 2,500.00
1	Tie 15-inch Storm to Manhole	1	LS	$ 1,750.00	$ 1,750.00
2	Adjust 18-inch Storm and Tie to Junction Box	1	LS	$ 4,000.00	$ 4,000.00
3	24" RCP Storm Sewer	427	LF	$ 80.00	$ 34,160.00
4	Connect 24" Storm to Junction Box	1	LS	$ 3,000.00	$ 3,000.00
5	30" RCP Storm Sewer	29	LF	$ 120.00	$ 3,480.00
6	5'W X 3'H Box Culvert	36	LF	$ 325.00	$ 11,700.00
7	6' X 6' Box Culvert	1254	LF	$ 700.00	$ 877,800.00
8	Precast 6' x 6' Bend	2	EA	$ 3,000.00	$ 6,000.00
9	8' X 6' Box Culvert	1326	LF	$ 825.00	$ 1,093,950.00
10	8' X 8' Box Culvert	768	LF	$ 925.00	$ 710,400.00
11	"E" Inlet Top on Prop. Box	8	EA	$ 3,500.00	$ 28,000.00
12	"A" Inlet Top on Prop. Box	2	EA	$ 2,500.00	$ 5,000.00
13	Type "C" Storm Manhole	1	EA	$ 3,500.00	$ 3,500.00
14	Type "C" Storm Manhole w/ "E" Inlet Top	1	EA	$ 6,000.00	$ 6,000.00
15	Oversized Junction Box for Prop. Box	4	EA	$ 25,000.00	$ 100,000.00
16	Oversized Junction Box for Prop. Box w/ "E" top	4	EA	$ 28,000.00	$ 112,000.00
17	Connect 24" Storm to 6' x 6' Box	3	EA	$ 2,875.00	$ 8,625.00
18	Connect 30" Storm to 6' x 6' Box	1	EA	$ 2,875.00	$ 2,875.00
19	Concrete Slope Paving	1	LS	$ 26,000.00	$ 26,000.00
20	Plug 6' x 4' Box	2	EA	$ 3,000.00	$ 6,000.00
21	Proposed Swale	3101	LF	$ 10.00	$ 31,010.00
22	Regrade Ditch	210	LF	$ 3.00	$ 630.00
23	Trench Safety	3453	LF	$ 3.00	$ 10,359.00
1	Construct Fence	393	LF	$ 30.00	$ 11,790.00
2	Construct Asphalt Paving	78	SY	$ 60.00	$ 4,680.00
3	Construct Concrete Paving	67	SY	$ 75.00	$ 5,025.00
1	Reinforced Filter Fabric Barrier	5	EA	$ 300.00	$ 1,500.00
2	Inlet Protection Barrier	18	EA	$ 200.00	$ 3,600.00
3	Stabilized Construction Entrances	3	EA	$ 2,400.00	$ 7,200.00
4	Concrete Truck Washout	1	EA	$ 4,000.00	$ 4,000.00
5	Hydromulch Seeding	3.5	AC	$ 2,800.00	$ 9,800.00
				Total Construction Costs	**$ 3,366,259.00**

NO.	NON-CONSTRUCTION ITEM	QTY	UNITS	UNIT PRICE	TOTAL PRICE
1	Basic Engineering				$ 339,411.00
2	Surveying and Geotechinical				$ 67,882.00
3	Subsurface Utility Engineering				$ 50,912.00
				Total Non-Construction Costs	**$ 458,205.00**
				Total All Costs	**$ 3,824,464.00**

City of Friendswood

Department of Public Works

Engineering Division

PROJECT MANUAL FOR

FM 518 New Sidewalks/Pavers and Driveways

PROJECT No.: GO1508

Bid No.: 2016-01

Divisions 00 through 03

ISSUED: January 2016

Daniel Scott Engineering, LLC
P.O. Box 1549
Alvin, TX 77512
(281)519-8530

SEAL

SECTION 00005B

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CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS

BOLD ITALICIZED Item is bound within this specification manual.

Regular non-italicized Item is not bound within this specification manual, however item is part of the contract. Contents of not bound items and specifications can be reviewed on line at the City of Friendswood's website or by disc available from the City's Projects Division. Location of the City of Friendswood Technical Specifications on-line follow the directions at the end of this Section.

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DIVISION 05 □ METALS

DIVISION 06 □ WOOD AND PLASTICS

DIVISION 07 □ THERMAL AND MOISTURE PROTECTION

DOCUMENT TITLE **SECTION**

DIVISION 08 DOORS AND WINDOWS

DIVISION 09 FINISHES

DIVISION 10 SPECIALTIES

DIVISION 11 EQUIPMENT

DIVISION 12 FURNISHINGS

DIVISION 13 SPECIAL CONSTRUCTION

DIVISION 14 CONVEYING SYSTEMS

DIVISION 15 MECHANICAL

DIVISION 16 ELECTRICAL

To view the City of Friendswood's Technical specifications got to the City of Friendswood's website at www.friendswood.com, then follow these steps:

1) Click on the Services for Business button in the top bar,
2) In the left side bar under Section Content, click the link for Projects, Engineering, and Storm Water Management.
3) In the left side bar under Project Management, click the link for Publications.
4) Scroll down to the bottom of the page and the links for the City of Friendswood's Technical Specifications are there.

END OF SECTION

SECTION 01400

UNIT PRICE DESCRIPTION

PART I: GENERAL

1.1 MEASUREMENT AND PAYMENT

A. It is the intent of the Contractor that the aggregate amount of the unit prices, times and unit of work actually installed, shall cover all work required by the Contract Documents, in place, complete, and ready for use.

B. Prices in the Contract Documents include all compensation for full completion of all work items in place, including providing all labor, materials, tools, equipment, services, supplies, incidental, and all necessary operations.

C. Work considered incidentals to the various pay items are as follows. No separate payment for this work will be made:

1. Delivery, Storage and Handling.

2. Work to protect items to remain by installation of temporary construction, including posting of warning signs, placement of protective fencing, barriers, barricades and covers, and restoration of damaged items to remain.

3. Work necessary to haul materials from original positions to points of disposition, including excavation of earth materials and utilization in construction or other disposition.

4. Work necessary to provide proper drainage during construction, including maintaining sections, existing ditches, channels, culverts, and sewers and including temporary construction and maintenance of ditches and drainage ways.

5. Clearing and Grubbing the removal and disposal of all above and below ground obstructions within the construction area.

6. Any work required to provide tree protection, maintenance and evaluation. Tree protection applies to all work items in the proposal.

7. All work associated with coordination of adjustment and locations of existing private utilities.

8. All traffic control and devices needed to assure proper traffic control.

D. Method of measurement and basis of payment for unit price work items shall be as stipulated in following paragraphs. Supplemental materials are to be used for material installed at locations other than indicated in the Drawings. The installation of supplemental materials shall be approved by the Project Manager.

1.2 UNIT PRICE BID ITEM DECRIPTIONS

{INSERT UNIT PRICE DESCRIPTIONS}

END OF SECTION

SECTION 01420

REFERENCE STANDARDS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. General quality assurance as related to Reference Standards and a list of references.

1.2 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade or Federal Standards, comply with requirement of the standard, except when more rigid requirements are specified or are required by applicable code.

B. Conform to reference standard by date of issue current on the date as stated in the General Conditions.

C. Request clarification from the Project manager before proceeding should specified reference standards conflict with the Contract Documents.

1.3 SCHEDULE OF REFERENCES

AASHTO American Society of State Highway and Transportation Officials
444 North Capitol Street NW, Suite 249
Washington, DC 20001-1512
TEL: (202) 624-5800
FAX: (202) 624-5806
WEB: www.transportation.org

ACI American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331-34396
TEL: (248) 848-3700
FAX: (248) 848-3701
WEB: www.concrete.org

AGC Associated General Contractors of America
2300 Wilson Boulevard, Suite 400
Alexandria, VA 22201-5426
TEL: (703) 548-3118
FAX: (703) 548-3119
WEB: www.acg.org

AI Asphalt Institute
2696 Research Park Drive
P. O. Box 14052
Lexington, KY 40511-8480
TEL: (859) 288-4960
FAX: (859) 288-4999
WEB: www.asphaltinstitute.org

AITC American Institute of Timber Construction
7012 S. Revere Parkway, Suite 140
Englewood, CA 80112-6769
TEL: (303) 792-9559
FAX: (303) 792-0669
WEB: www.aitc-glulam.org

AISC American Institute of Steel Construction
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
TEL: (312) 670-2400
FAX: (312) 670-5403
WEB: www.aisc.org

AISI American Iron and Steel Institute
1140 Connecticut Avenue NW, Suite 705
Washington, DC 20036-4011
TEL: (202) 452-7100
WEB: www.steel.org

ASME American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990
TEL: (973) 882-1170
FAX: (973) 882-1717
WEB: www.asme.org

ANSI American National Standards Institute
1819 L Street NW
Sixth Floor
Washington, DC 20036-3807
TEL: (202) 293-8020
FAX: (202) 293-9287
WEB: www.ansi.org

APA American Plywood Association
7011 S. 19th Street
Tacoma, WA 98466-5333
TEL: (253) 620-7400
FAX: (253) 565-7265
WEB: www.apawood.org

API American Petroleum Institute
1220 L Street, NW
Washington, DC 20005-4070
TEL: (202) 682-8000
WEB: www.api.org

AREMA American Railway Engineering and Maintenance-of-Way Association
10003 Derekwood Lane, Suite 210
Lanham, MD 20706-4875
TEL: (301) 459-3200
FAX: (301) 459-8077
WEB: www.arema.org

ASTM American Society for Testing and Materials
100 Barr Harbor Drive
West Conshoshocken, PA 19428-2959
TEL: (610) 832-9500
WEB: www.astm.org

AWPA American Wood Protection Association
P.O. Box 361784
Birmingham, AL 35236-1784
TEL: (205) 733-4077
FAX: (205) 733-4075
WEB: www.awpa.com

AWS American Welding Society
550 NW LeJeune Road
Miami, FL 33126-5649
TEL: (305) 443-9353
WEB: www.aws.org

AWWA American Water Works Association
6666 W Quincy Avenue
Denver, CO 80235-3098
TEL: (303) 794-7711
FAX: (303) 794-0804
WEB: www.awwa.org

CFTS City of Friendswood Technical Specifications
City Hall Community Development Department
910 S. Friendswood Drive
Friendswood, TX 77546-4856
TEL: (281) 996-3201
FAX: (281) 996-3260
WEB: www.ci.friendswood.tx.us

CLFMI Chain Link Fence Manufacturers Institute
10015 Old Columbia Road, Suite B-215
Columbia, MD 21046-1865
TEL: (301) 596-2583
FAX: (301) 596-2594
WEB: www.arcat.com

CRSI Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, IL 60173-4758
TEL: (847) 517-1200
FAX: (847) 517-1206
WEB: www.crsi.org

EJMA Expansion Joint Manufacturers Association
25 North Broadway
Tarrytown, NY 10591-3221
FAX: (914) 332-1541
WEB: www.ejma.org

FS Federal Standardization Documents
General Services Administration
Specifications Unit (WFSIS)
7th and D Streets, Southwest
Washington, DC 20406-0001
WEB: www.gsa.gov

ICEA Insulated Cable Engineer Association
P. O. Box 1568
Carrollton, GA 30112-0030
TEL: (770) 830-0369
WEB: www.icea.net

IEEE Institute of Electrical and Electronics Engineers
445 Hoes Lane
Piscataway, NJ 08854-4141
TEL: (732) 981-0060
WEB: www.ieee.org

ISA International Society of Arboriculture
P. O. Box 3129
Champaign, IL 61826-3129
TEL: (217) 355-9411
WEB: www.isa-arbor.com

MIL Military Specifications
General Services Administration
Specifications Unit (WFSIS)
7th and D Streets, Southwest
Washington, DC 20406-0001
WEB: www.gsa.gov

NACE National Association of Corrosion Engineers
1440 South Creek Drive
Houston, TX 77084-4906
TEL: (281) 228-6200
FAX: (281) 228-6300
WEB: www.nace.org

NEMA National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209-3806
TEL: (703) 841-3200
FAX: (703) 841-5900
WEB: www.nema.org

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471
TEL: (617) 770-3000
FAX: (617) 770-0700
WEB: www.nfpa.org

NICET	National Institute for Certification in Engineering Technologies 1420 King Street Alexandria, VA 22314-2794 TEL: (888) 476-4238 WEB: www.nicet.org
OSHA	Occupational Safety Health Administration 200 Constitution Avenue, NW Washington, DC 20210-0001 TEL: (800) 321-6742 WEB: www.osha.gov
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-1053 TEL: (847) 996-6200 FAX: (847) 996-8389 WEB: www.cement.org
PCI	Prestressed Concrete Institute 209 W. Jackson Boulevard, Suite 500 Chicago, IL 60606-6938 TEL: (312) 786-0300 WEB: www.pci.org
SDI	Steel Deck Institute P. O. Box 25 Fox River Grove, IL 60021-0025 TEL: (847) 458-4647 FAX: (847) 458-4648 WEB: www.sdi.org
TAC	Texas Administrative Code Secretary of State P. O. Box 12887 Austin, TX 78711-2887 TEL: (512) 463-0500 WEB: www.sos.state.tx.us
TCEQ	Texas Commission on Environmental Quality P. O. Box 13087 Austin, TX 78711-3087 TEL: (512) 239-1000 WEB: www.tceq.state.tx.us

TxDOT Texas Department of Transportation
125 East 11th Street
Austin, TX 78701-2409
TEL: (512) 305-9500
WEB: www.dot.state.tx.us

UL Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, IL 60062-2096
TEL: (847) 272-8800
FAX: (847) 272-8129
WEB: www.ul.com

UNI-BELL UNI-BELL Pipe Association
2711 LBJ Freeway, Suite 1000
Dallas, TX 75234-7354
TEL: (972) 243-3902
FAX: (972) 243-3907
WEB: www.uni-bell.org

PART II: PRODUCTS NOT USED.

PART III: EXECUTION NOT USED.

END OF SECTION

SECTION 01430

PROJECT SIGNAGE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for furnishing, fabricating and installing non-reflectorized plywood project signs.

B. Requirements for furnishing, fabricating and installing various interior and exterior aluminum and plastic signs.

C. Installation of aluminum reflectorized street signage.

D. Commemorative Plaques.

1.2 PAYMENT AND MEASUREMENT

A. Unit Prices:

1. Payment for Project Signs shall be per each sign, which shall be full compensation for sign blanks, fabrication of the sign, signposts, all mounting hardware, washing, cleaning, repairing, all incidentals needed to furnish, fabricate and erect sign, and removal of the sign.

2. Payment for signage in buildings shall be on an allowance basis.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. APA The Engineered Wood Association.

B. ASTM American Society for Testing and Materials.

1. ASTM A 153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A 307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

3. ASTM B 209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

4. ASTM B 449 Standard Specification for Chromates on Aluminum.

5. ASTM B 695 Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

6. ASTM D 4956 Standard Specification for Retroreflective Sheeting for Traffic Control.

C. Canadian Council of Forest Industries (COFI).

D. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02865 Traffic Signs.

4. Section 03300 Structural Concrete.

E. TxDOT Texas Department of Transportation.

1. Compliant Work Zone Traffic Control Devices (CWZTCD), latest edition.

2. Department of Materials Specification DMS-7100 Plywood Sign Blanks.

3. Department of Materials Specification DMS-7110 Aluminum Sign Blanks.

4. Department of Materials Specification DMS-8300 Sigh Face Materials.

5. Standard Specifications for Construction of Highways, Streets and Bridges Item 634 Plywood signs (Type A).

6. Standard Specifications for Construction of Highways, Streets and Bridges Item 636 Aluminum Signs (Type A).

7. Texas Manual on Uniform Traffic Control Devices (TMUTCD), Latest Edition.

F. U.S. Product Standards PS 1.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturers' product data for following items for approval for each type of signage specified in this Section.

C. Submit shop drawings and proofs for Interior and Exterior signage and Commemorative Plaque.

D. Submit manufacturers certification that all signage meets requirements in this Specification.

PART II: PRODUCTS

2.1 PLYWOOD SIGN BLANKS

A. Plywood signs shall conform to Item 634 of the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges (TxDOT) and TxDOT Department of Materials Specification DMS-7100.

B. Plywood blanks shall be five-eighths (5/8) inch thick. Plywood shall be smooth, weather-resistant, of one (1) piece construction and free of scarf or finger joints.

C. Plywood shall bear legible grade markings of APA The Engineered Wood Association or the Canadian Council of Forest Industries (COFI) and shall meet the following requirements:

1. Use plywood that is natural in color or the color approved by the Project Manager.

2. Classification of Species shall be a group one (1) species classification.

3. Exposure Durability Classification shall be for exterior.

4. Use Grade B or better for face and back veneers.

5. Inner plies shall be:

   a. Grade B jointed or

   b. Grade C plugged jointed

6. Inner ply gaps:

   a. Do not exceed three-eighths (3/8) inch for any gaps between adjacent pieces of jointed inner ply and do not exceed three-sixteenths (3/16) inch for average of all gaps in a panel.

   b. Do not exceed four (4) core gaps and edge splits per eight (8) feet of cross-band layer.

7. Use overlay sheets on both sides of the plywood panel of high density material that meets or exceeds the latest revision of U.S. Product Standards PS □ 1.

8. Plywood shall maintain a flatness that shall not deviate from a plane surface by more that two (2) inches.

9. Sign blanks shall be of one continuous piece of plywood and shall not be spliced.

10. Plywood blanks shall be used for Temporary or Construction Traffic Signage only.

2.2 ALUMINUM SIGN BLANKS

A. Aluminum sheet or coil sign blanks shall meet all requirements of TxDOT Standards Specification Item 635, TxDOT DMS-7110 Aluminum Sign Blanks and ASTM B 209, Alloys 6061-T-6 or 5052-H38.

B. Sign blanks made from sheet or coil shall be free of buckles, warps, dents, cockles, burrs and other defects an must be a plane surface. Sign blank thickness shall be eight-hundredths (0.08) inch.

C. Treat all sign blanks fabricated from sheet and coil with a chromate chemical process resulting in a coating meeting the requirements of ASTM B 449, Class 2. The coating shall be light colored, tight and free from powdery residues.

D. Manufacturer shall furnish mill test reports for aluminum sheet or coil which reflect the chemical and physical properties of the aluminum.

2.3 SIGN MOUNTING HARDWARE AND ADHESIVES

A. All material for sign posts and mounting hardware shall be galvanized steel and be in compliance with ASTM A307, ASTM A153 and ASTM B695.

B. Sign posts shall be galvanized steel two and three-eighths (2-3/8) inch outside diameter.

C. Sign Post mounting shall be Pos-Lok or equal system consisting of sixteen (16) inch sleeve and removable wedge.

D. Pipe and post clamp castings and miscellaneous fasteners shall be verified by manufacturer's certifications stating that the material meets all applicable requirements.

E. Interior signage shall either use fasteners or bound adhesive to fasten sign to the wall.

F. Exterior signage and plaque shall have studs on back of signage and use either cement or bonding agent.

2.4 FACE MATERIALS

A. All materials are to be certified by lot or shipment that material supplied meets requirements listed in this Specifications. Material shall also comply with ASTM D4956 and TxDOT DMS 8300.

B. Sign face materials shall be processed, applied and stored according to the manufacturer's recommendations. Sign face materials shall perform for a minimum of ten (10) years.

C. The Project Manager shall reject any sign and/or face material for the following reasons:

1. Cracks discernible with the unaided eye from the driver's position while in an outside lane at a distance of fifty (50) feet or greater from the sign;

2. Peeling in excess of one-quarter (1/4) inch;

3. Shrinkage in excess of one-eighth (1/8) inch total per forty-eight (48) inches of sheeting width

4. Fading or loss of color to the extent that color fails to meet the requirements of ASTM D 4956 or TxDOT DMS 8300;

5. In non-construction zone loss of reflectivity to a level eighty (80) percent of the minimum values as specified in ASTM D 4956;

6. In construction zone loss of reflectivity to a level sixty (60) percent of the minimum values as specified in ASTM D 4956; or

7. Consist of pressure activated material of diamond or prismatic vinyl.

D. Any sign face that does not conform to this Section shall be rejected, and the Contractor shall replace it with no additional cost to the City.

2.5 INTERIOR BUIILDING SIGNAGE

A. All interior signs shall be made of intergraded photo-etched plastic, with letters either raised or etched. All interior signage shall be ADA compliant and shall include at the bottom of the sign Grade 2 Braille raised one-thirty-seconds (1/32) inch.

2.6 EXTERIOR BUILDING SIGNAGE

A. Raised lettering and numbers on the exterior of buildings shall be of the type and size shown in the Drawings and approved by the Project Manager.

B. Acceptable sign materials shall be one (1) of the following:

1. Anodized Aluminum, satin finish.

a. Color shall be either clear satin or;

b. Medium Bronze or;

c. Dark Bronze

2. Bronze finish

a. Color shall be either natural satin or;

b. Oxidized Bronze or;

c. Dark Oxidized

3. Plastic or Acrylic

a. Color shall compliment the building finish and to be selected by the City.

2.7 PROJECT SIGN

A. Projects signs shall use materials as stated in paragraphs 2.1 and 2.4. Signs using non-reflective facing shall be in conformance with the City's Sign Ordinance. Sign post shall be painted non-reflective white.

B. Project sign shall have the following information:

1. City of Friendswood Seal

2. Words City of Friendswood

3. Project Name

4. Design Professional Name and address

5. Contractor Name, address and phone number

6. Name of Mayor, City Council and City Manager

7. City contact information

C. Proof shall be approved by the Project Manager before sign is made. If the Contractor has the sign made without the approval of the Project Manager, the Contractor shall replace at no additional cost to the City. See Figure 4.1 of this Section for typical project sign.

2.8 COMMEMORATIVE PLAQUE

A. Commemorative plaques shall be made of either brass or bronze. Finish shall be either dark oxidized or light oxidized. Lettering shall have satin finish.

B. Commemorative plaque shall be either eighteen (18) inches wide by twenty-four (24) inches tall, or twenty-four (24) inches wide by eighteen (18) inches tall.

C. Commemorative plaque shall have the following information:

1. City of Friendswood Seal

2. Words City of Friendswood

3. Project Name

4. Name of Mayor, City Council and City Manager at the time that the Project was funded and approved for construction.

5. Year the construction was completed.

6. Optional emblem of Sponsor Department.

2.9 TEMPORARY SIGN POSTS

A. Sign posts shall be either:

1. Four (4) inch by four (4) inch Pressure Treated Lumber. Sign posts shall be painted non-reflective white. Timber post shall be used for temporary construction and temporary projects signs only, no exceptions.

2. One and seven-eighths square galvanized metal tubing (SGMT), with seven-sixteenths (7/16) holes punched on one (1) inch centers. SGMT and mounting shall conform to the TxDOT Construction Work Zone Traffic Control Devices (CWTZTD). This sign post shall be used for temporary construction signs only, no exceptions.

B. Posts shall be installed as specified in Paragraph 3.2.A.2.a or other method approved by the Project Manager.

PART III: EXECUTION

3.1 GENERAL

A. Installation of signs shall be in compliance with current City of Friendswood Sign Ordinance.

B. All signs shall be installed at the locations directed by the Project Manager.

3.2 TRAFFIC SIGNS

A. All traffic signs, whether permanent or temporary, and their installation shall be accordance with the latest edition of the Texas Manual on Construction Traffic Control Devices (TMUTCD), Construction Work Zone Traffic Control Devices (CWZTCD) and Section 02865 Traffic Signs.

1. Permanent Signs

a. Permanent traffic sign posts mounting device shall be set a minimum of two (2) foot six (6) inches in depth in a twelve (12) inch diameter hole filled with Class C concrete as specified in Section 03300 Structural Concrete to within three (3) inches below finished grade.

b. Mounting wedge shall extend two (2) inches above natural grade.

c. Bottom of sign shall be a minimum of seven (7) feet above natural or finished grade or above top of curb/edge of pavement, whichever is higher.

d. Side of sign closest to traffic shall be a minimum of two (2) feet from either back of curb or edge of pavement.

2. Temporary Traffic Sign

a. Temporary construction posts shall be set a minimum of three (3) feet in depth in a twelve (12) inch diameter hole filled with either sand or natural ground which shall be compacted to ninety-five (95) percent density.

b. Bottom of sign shall be a minimum of seven (7) feet above natural or finished grade or above top of

curb/edge of pavement, whichever is higher.

c. Side of sign closest to traffic shall be a minimum of two (2) feet from either back of curb or edge of pavement.

d. Signs shall be maintained, cleaned and repaired as needed during the construction of the project.

e. Signs shall be permitted and installed on the right-of-way where designated by the Project Manager or Traffic Control Plan.

f. The signs shall become the property of the Contractor and shall be removed at the completion of the project.

3.3 PROJECT SIGN

A. project sign posts shall be set a minimum of three (3) feet in depth in a twelve (12) inch diameter hole filled with either sand or natural ground which shall be compacted to ninety-five (95) percent density.

B. Project signs shall be mounted so that the top of the sign does not exceed eight (8) feet above natural ground.

C. There shall be two (2) signs for street, drainage and utility improvements or one (1) sign for public facility projects.

D. Signs shall be maintained, cleaned and repaired as needed during the construction of the project.

E. Signs shall be permitted and installed on the right-of-way or the project site where designated by the Project Manager or Traffic Control Plan.

F. The signs shall become the property of the Contractor and shall be removed at the completion of the project.

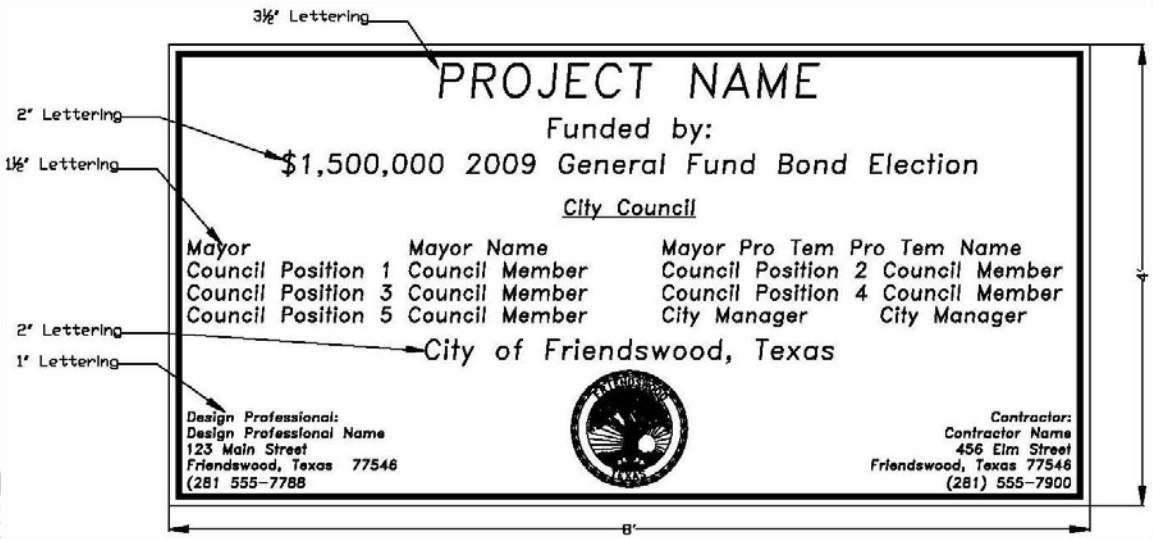
3.4 INTERIOR AND EXTERIOR SIGNS AND COMMEMORATIVE PLAQUE.

A. Interior and exterior signs and Commemorative Plaque shall be installed in conformance with all specifications in this Section.

B. All protective coatings or materials shall remain in place until facility is accepted.

PART IV: FIGURES

4.1 TYPICAL PROJECT SIGN



END OF SECTION

SECTION 01450

CONTRACTOR'S QUALITY CONTROL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Quality assurance and control of Installation and manufacturers field services and reports.

1.2 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over Suppliers, Manufacturers, Products, services, site conditions and workmanship, to produce work of specified quality at no additional cost to the City.

B. Comply fully with manufacturers Installation instructions, including each step in sequence.

C. Request clarification from the Project Manager before proceeding when manufacturers instructions conflict with the Contract Documents.

D. Comply with specified standards as minimum requirements for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform the Work by persons qualified to produce a specified level of workmanship.

1.3 REFERENCES

A. Obtain copies of standards and maintain at job site when required by individual Technical Specification sections.

1.4 MANUFACTURERS FIELD SERVICES AND REPORTS

A. When specified in individual Technical Specification sections, or as required by the Project Manager, provide Product suppliers or manufacturers technical representative to observe site conditions, conditions of surfaces and Installation, quality of workmanship, start-up of equipment, operator training, testing, adjusting and balancing of equipment as applicable and to initiate required operation. Conform to minimum time requirements for start-up operations and operator training when provided in Technical Specification sections.

B. At the Project Manager's request, submit qualifications of manufacturers' representative to the Project Manager fifteen days (15 D) in advance of required representatives' services. Representative is subject to approval by the Project Manager.

C. Manufacturer's representatives shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to a manufacturer's written instructions. Submit report within fourteen days (14 D) of observation to the Project Manager for review.

PART II: PRODUCTS - NOT USED.

PART III: EXECUTION - NOT USED.

END OF SECTION

SECTION 01455

INSPECTION SERVICES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Inspection services and references.

1.2 INSPECTION

A. The Director of Community Development shall appoint a Project Manager to represent the City and perform inspections, tests, and other services specified in individual Technical Specification sections.

B. The Director of Community Development may also appoint, employ, and pay an independent firm to provide additional inspection or construction management services as indicated in Section 01470 Testing Laboratory Services.

C. The independent firm will submit reports to the Project Manager, indicating observations and results of tests and indicating compliance or noncompliance with the Contract requirements.

D. The Contractor shall assist and cooperate with the Project Manger; furnish samples of materials, design mix, equipment, tools, and storage.

E. Contractor shall notify the Project Manager a minimum of twenty-four hours (24 Hrs) prior to expected time for operations requiring services.

F. Contractor shall sign and acknowledge reports for the Project Manager.

PART II: PRODUCTS NOT USED.

PART III: EXECUTION NOT USED.

END OF SECTION

SECTION 01460

OBSERVATION OF CONSTRUCTION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. This section outlines the duties, responsibilities and limitations of authority of the project representative in connection with his observation of the work.

1.2 AUTHORITY

A. The City's Design Professional Services of the project representative, in assisting the City's Design Professional, are set forth in Section 00500 General Conditions. In particular, the definition of the City's Design Professional's duties provides authority for observation of the work.

B. Special Testing The Project Representative s authority to require special observation or testing in connection with rejected work is also provided in Section 00500 General Conditions. Furthermore, the provision that, upon request by the Contractor, the Project Representative observe and accept or reject any material furnished is also granted in the Section 00500 General Conditions.

C. Removing Work The provision for removing work for observation by the Project Representative is granted in the Section 00500 General Conditions.

PART II: DEFINITIONS

2.1 PROJECT REPRESENTATIVE

A. The Project Manager shall be the project representative of the City. If an independent individual so named is the City's Design Professional, the City's Design Professional s project representative will be assigned such authority, but shall not override the authority of the City's Project Manager.

2.2 NORMAL WORKING DAYS

A. Normal working days for project representatives are defined as Monday through Friday, exclusive of holidays and between the hours of seven

(7) A.M. to eight (8) P.M. If the Contractor plans work on a Saturday, Sunday or legal holiday, work arrangements shall be made for a project representative a minimum of forty-eight hours (48 Hrs) before the last normal working day before the Saturday, Sunday, or legal holiday.

B. Non-normal work shall be subject to the specifications listed in Section 01140 Work Restrictions, Paragraph 1.13.

2.3 UNINSPECTED WORK

A. The Project Manager shall request that the Contractor remove or replace any work completed that was not observed by the project representative or the Project Manager. Removal or replacement will be completed at no additional cost to the City.

PART III: PROJECT REPRESENTATIVE

3.1 TRANSLATION

A. Assist the Contractor s superintendent in understanding the intent of the Technical Specifications and the Construction Plans.

3.2 SPOT CHECKS

A. Conduct on-site observations and spot checks of the work in progress as a basis for determining conformance of work, materials, and equipment with the Technical Specifications and the Construction Drawings.

3.3 CONSIDERATION

A. Consider and evaluate suggestions or recommendations which may be submitted by the Contractor to the Project Manager and report them with recommendations to the Project Manager for final decision.

3.4 SCHEDULING

A. Be alert to the construction schedule and to conditions which may cause delay in completion, and report same to the Project Manager.

3.5 LIAISON

A. Maintain liaison with the Contractor and all subcontractors on the project only through the Contractor s superintendent.

3.6 PARTICIPATION

A. Attend conferences held at the project site as directed by the Project Manager. Report to the Project Manager the results of such meetings.

3.7 ADVISING

A. Advise the Project Manager in advance of the schedules of tests and observe that tests at the project site, which are required, by the Technical Specifications and Construction Drawings are actually conducted. Observe, record and report to the Project Manager all details relative to the test procedures.

3.8 ACCOMPANYING OTHERS

A. Accompany anyone representing local, state or federal agencies having jurisdiction, on site visits of the project. Record and report to the Project Manager the results of these site visits.

3.9 RECEIVING

A. Receive samples which are required to be furnished at the site; record date received and from whom, and notify the Project Manager of their readiness for examination; record the Project Manager's approval or rejection; and maintain custody of approved samples.

3.10 REVIEWING

A. Review applications for payment submitted by the Contractor and forward them with recommendations regarding payment and progress to the Project Manager.

3.11 CHECKING

A. After substantial completion, check each incomplete or defective item as it is corrected.

3.12 REPORTING

A. If a situation arises during construction, which requires that work be rejected, report such situation immediately to the Project Manager.

3.13 LIMITATIONS

A. The project representative shall not:

1. Authorize deviations from the Contract Documents;

2. Personally conduct any test;

3. Enter into the area of responsibility of the Contractor's superintendent;

4. Expedite the work for the Contractor;

5. Advise on, or issue directions relative to any aspect of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work;

6. Authorize or suggest that the City occupy the project, in whole or in part, prior to substantial completion;

7. Issue a recommendation for payment;

8. Exceed limitations of the City's Design Professional's authority as set forth in the Contract Documents; or

9. Accept Shop Drawings or Samples from anyone other than the Contractor.

END OF SECTION

SECTION 01470

TESTING LABORATORY SERVICES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Testing laboratory services and the Contractor responsibilities related to those services.

1.2 REFERENCES

A. A2LA The American Association for Laboratory Accreditation.

B. ASTM American Society for Testing and Materials.

1. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

2. ASTM D3666 - Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials.

3. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

4. ASTM E329 - Standard Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

C. CFTS City of Friendswood Technical Specifications

1. Section 00020 List of Pre-qualified Testing Laboratories.

2. Section 00500 General Conditions.

3. Section 01475 Quality Control Testing Procedures.

D. ISO/TES International Organization for Standards.

1. ISO/TEC Guide 25 - General Requirements for the

Competence of Calibration and Testing Laboratories.

E. TxDOT Texas Department of Transportation.

1.3 SELECTION AND PAYMENT

A. The City shall select, employ, and pay for services of an Independent Testing Laboratory to perform inspection and testing identified in Part III of individual Technical Specification sections.

B. The Contractor may employ and pay for services of an independent testing laboratory or laboratories to perform inspection and testing identified in Part II of individual Technical Specification sections.

C. Employment of a testing laboratory by the City shall not relieve the Contractor of its obligation to perform the Work in accordance with requirements of the Contract Documents.

D. The City shall deduct a minimum two hour (2 Hr) charge for testing laboratory time from periodic progress payment when operations requiring testing or inspection are canceled without prior notification.

E. The City shall deduct cost of any necessary retesting, whenever failed work is removed and replaced, from periodic progress payment.

1.4 QUALIFICATION OF LABORATORY

A. Meet laboratory requirements of ASTM E329 and applicable requirements of ASTM C1077, ASTM D3666, and ASTM D3740.

B. Meet ISO/TEC Guide 17025 conditions for accreditation by the American Association for Laboratory Accreditation (A2LA) in specific fields of testing required in individual Technical Specification sections.

C. If laboratory subcontracts are part of the testing services, such work shall be placed with a laboratory complying with the requirements of this Section.

D. Testing on all projects with public utilities shall be from one (1) or more testing laboratories listed in Section 00020 List of Pre-Qualified Testing Laboratories.

1.5 LABORATORY REPORTS

A. Testing laboratory shall provide and distribute copies of laboratory reports to the distribution list the City's Project Manager provides at the

pre-construction conference.

B. Keep one (1) copy of each laboratory report distributed or faxed at the site field office for duration of the Work. Laboratory shall fax material supplier, the Contractor and the City's Project Manager reports that indicate failing test results by no later than close of business on the working day following test completion and review.

1.6 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge requirements of the Contract.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume the Contractor duties

D. Laboratory has no authority to stop the Work.

1.7 CONTRACTOR RESPONSIBILITIES

A. Provide safe access to the Work and to manufacturer s facilities for the City's Project Manager and for testing laboratory personnel.

B. Provide testing laboratory with a copy of the Construction Schedule and a copy of each update to Construction Schedule.

C. Notify the City's Project Manager and testing laboratory a minimum of twenty-four hours (24 Hrs) previous to expected time for operations requiring inspection and testing services. When the Contractor fails to make timely prior notification, do not proceed with the operations requiring inspection and testing services.

D. Notify Design Consultant twenty-four hours (24 Hrs) in advance when Technical Specification requires presence of Design Consultant for sampling or testing.

E. Request and monitor testing as required to provide timely results and to avoid delays to the Work. Provide samples to laboratory in sufficient time to allow required test to be performed in accordance with specified test methods before intended use of the Product.

F. Cooperate with laboratory personnel in collecting samples on site. Provide incidental labor and facilities for safe access to the Work to be tested, to obtain and handle samples at site or at source of Products to be tested, and to facilitate tests and inspections including storage and

curing of test samples.

G. Make arrangements with laboratory through the City's Project Manager. Payment for additional testing shall be made in accordance with Section 00500 □ General Conditions:

1. Re-testing required for failed tests.

2. Re-testing for nonconforming work.

3. Additional sampling and tests requested beyond specified requirements.

4. Insufficient notification of cancellation of scheduled tests of which are not performed.

PART II: PRODUCTS □ NOT USED.

PART III: EXECUTION

3.1 CONDUCTING TESTING

A. Conform to laboratory sampling and testing methods specified in individual Technical Specification sections to the latest issues of ASTM standards, TxDOT methods, or other recognized test standards as approved by the City's Project Manager.

B. Requirements of this Section shall also apply to those tests for approval of materials, for mix designs, and for quality control of materials as performed by employed testing laboratories.

C. All testing requirements and quantities shall conform to Section 01475 □ Quality Control Testing Procedures unless otherwise approved by the Project Manager.

END OF SECTION

SECTION 01475

QUALITY CONTROL TESTING PROCEDURES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide procedures and quantities for testing of materials, backfill, concrete and other items used.

B. Provide procedures and quantities for testing of water lines, sanitary sewer lines and manholes.

C. Only Independent Testing Laboratories conforming to Section 00020 □ List of Pre-Qualified Testing Laboratories shall be used. NO EXCEPTIONS.

D. Testing requiring an Approved Independent Testing Laboratory shall be executed by a laboratory technician that is certified in the test being taken. At no time shall an uncertified technician be allowed to sample or test any material except under direct supervision of a qualified and certified technician. NO EXCEPTIONS.

E. NICET and ACI are recognized certification companies for Laboratory Technicians.

F. Requirements in this Section are made for quick reference purposes only on the most common testing incorporated in the Work. Refer to individual work Sections for full details on testing materials, procedures, quantities and frequencies.

1.2 MEASUREMENT AND PAYMENT

A. There shall be no separate payment of items under this Section. All testing, material, labor and equipment supplied by either the Approved Independent Testing Laboratory or the Contractor is incidental to the Work.

B. Contracting with an Independent Testing Laboratory.

1. The City shall contract with an Independent Testing Laboratory for projects funded by public funds. Any retest of failed tests or materials shall be at the Contractor's expense and deducted

from the next progress payment unless Contractor has made financial arrangements with the Independent Testing Laboratory.

2. Owners of private development projects, even in the event they are installing public infrastructure, shall contract with an Independent Testing Laboratory. The Independent Testing Laboratory shall not have any affiliation with the Owners, Contractors, Engineers or Architects on the project and shall be qualified as per Section 01470 Testing Laboratory Services.

1.3 OBSERVATION

A. The City's Project Manager shall be onsite for all testing procedures for the duration of the test and observe all procedures and document the adherence to the testing procedures as stated in this Section.

B. The City's Project Manager shall be copied on all testing reports issued by the Independent Testing Laboratory.

1.4 REFERENCES

ASTM American Society for Testing and Materials.

CFSD City of Friendswood Standard Details.

CFTS City of Friendswood Technical Specifications.

TCEQ Texas Commission on Environmental Quality.

TDSHS Texas Department of State Health Services.

TxDOT Texas Department of Transportation

A. BACKFILL TESTING

1. ASTM C33 Standard Specification for Concrete Aggregates (Fine Aggregate).

2. ASTM D558 Standard Test Methods for Moisture-Density Relations of Soil Cement Mixtures.

3. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft).

4. ASTM D1140 □ Standard Test Method for Amount of Material in Sols Finer than No. 200 Sieve.

   ASTM D1163 □ Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

5. ASTM D2216 □ Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

6. ASTM D2487 □ Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

7. ASTM D4318 □ Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

8. CFTS Section 02110 □ Borrow.

9. CFTS Section 02120 □ Excavation and Backfill for Structures.

10. CFTS Section 02125 □ Excavation and Backfill for Utilities.

11. CFTS Section 02140 □ Utility Backfill Materials.

B. CONCRETE TESTING

1. ASTM C31 □ Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 □ Standard Specification for Concrete Aggregates.

3. ASTM C39 □ Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C94 □ Standard Specification for Ready-Mixed Concrete.

5. ASTM C143 □ Standard Test Method for Slump of Hydraulic Cement Concrete.

6. ASTM C172 □ Standard Practice for Sampling Freshly Mixed Concrete.

7. ASTM C173 □ Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

8. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

9. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

10. ASTM C498 – Standard Specification for Chemical Admixtures for Concrete.

11. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

12. CFTS Section 03200 – Reinforcing Steel.

13. CFTS Section 03300 – Structural Concrete.

C. DETENTION POND

1. CFTS Section 02900 – Turf Establishment.

2. HCFC- Harris County Flood Control.

3. GCCDD – Galveston County Consolidated Drainage District.

D. SANITARY SEWER MANHOLES

1. CFTS Section 02525 – Acceptance Testing for Gravity Sanitary Sewer Lines.

E. SANITARY SEWER FORCE MAINS

1. ASTM F2164 – Standard Practice for Field Leak Testing of Polytethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.

2. CFTS Section 02450 – Hydrostatic Testing of Waterlines.

3. CFTS Section 02510 – Sanitary Sewer Force Mains.

F. SANITARY SEWER GRAVITY LINES

1. ASTM C924 – Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

2. ASTM D3034 – Standard Specification for Type PSM (Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

3. ASTM F1417 Standard Test Method for Installation Acceptance of Plastic Gravity Sanitary Sewer Lines Using Low Pressure Air.

4. CFTS Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.

G. SUBGRADE

1. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

2. ASTM D4318 Standard Test Procedures of Liquid Limit, Plastic Limit and Plasticity Index of Soils.

3. CFTS Section 02700 Cement-Stabilized Base Course.

4. CFTS Section 02720 Lime-Stabilized Base Subgrade.

5. TxDOT Tex-101-E Preparing Soils and Flexible Base Materials for Testing.

6. TxDOT Tex-140-E Measuring Thickness of Pavement Layer.

7. TxDOT Tex-600-J Sampling and Testing Lime.

H. WATER LINES

1. ASTM F2164 Standard Practice for Field Leak Testing of Polytethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.

2. CFTS Section 02450 Hydrostatic Testing of Waterlines.

3. CFTS Section 02455 Disinfection of Waterlines.

PART II: PRODUCTS

2.1 The Contractor is to supply all equipment and labor needed to complete any test listed in this Section. The City's Project Manager is there to observe test and verify compliance of specifications only. The City's Project Manager shall not help or assist in any way.

PART III: EXECUTION

3.1 The Contractor shall notify the City's Project Manager a minimum of forty-eight hours (48 Hrs) in advance of any work which shall require testing. Only the City's Project Manager shall call the Independent Testing Laboratory and schedule their services, no exceptions.

3.2 All testing requirements stated in this Section are minimal testing requirements. At the discretion of the City's Project Manager, more testing can be authorized. Additional testing may be requested by the Contractor at no additional cost to the City and with the approval of the City's Project Manager.

3.3 BACKFILL

A. Class I, II, and III backfill and Select fill lift placement shall not exceed six inches (6 In) to eight inches (8 In) of loose material. Clumps of material larger than six inches (6 In) in any direction shall not be allowed. Dry Density and Moisture content shall be determined by ASTM D698.

1. Frequency One (1) test per lift per five hundred linear feet (500 Lf), or fraction thereof if less than five hundred linear feet (500 Lf), of trench or between manholes, whichever is shorter. A minimum of three (3) density tests per lift per day shall be required.

2. Compaction in the ROW Compaction shall be a minimum of ninety-five percent (95%) of dry density and moisture shall be at optimum plus or minus three percent (± 3%).

3. Compaction outside of the ROW Compaction shall be a minimum of ninety percent (90%) of dry density and moisture shall be at optimum plus or minus three percent (± 3%).

B. Bank run sand shall be classified using ASTM D2487. Bank run sand lift placement shall not exceed twelve inches (12 In) of loose material.

1. Bank run sand shall have no more than two percent (2%) clay lumps or balls.

2. Bank run sand shall have less than fifteen percent (15%) material passing through a No. 200 sieve as determined by ASTM D1140.

3. Material passing No. 40 and have a Plasticity Index less than seven (7) as determined by ASTM D4318.

C. Cement-Stabilized Sand shall be a minimum of one and one tenth (1.1) sacks of cement per one ton (1 Tn) of sand. Sand shall meet grading requirements for Fine Aggregates of ASTM C33. Cement-stabilized sand lift placement shall not exceed twelve inches (12 In) of loose material.

1. Sampling of cement-stabilized sand shall be either:

   a. Three (3) samples taken from the truck, one (1) from each one-third (1/3) of the truck, beginning third (3rd), middle third (3rd) and last third (3rd), or;

   b. One (1) sample shall be taken per one hundred fifty tons (150 Tn) or one (1 pD) production day, whichever is less.

2. Mold four (4) specimens, per sample taken, in accordance with ASTM D558, Method A.

3. Compaction shall be a minimum of ninety-five percent (95%) and moisture shall be at optimum plus or minus three percent (± 3%), as determined by ASTM D558.

4. Compressive strength of cement-stabilized sand shall be tested in accordance with ASTM D1163.

   a. Two (2) specimens shall be tested at forty-eight hours (48 Hrs) plus or minus two hours (±2 Hrs). Compressive strength shall be average of both specimens and shall be no less than one hundred pounds per square inch (100 psi), with no one (1) specimen compressive strength below seventy pounds per square inch (70 psi).

   b. Two (2) specimens shall be tested at seven days (7 D) plus or minus four hours (±4 Hrs). Compressive strength shall be average of both specimens and shall be equal to or greater than one hundred pounds per square inch (100 psi), with no one (1) specimen compressive strength below one hundred pounds per square inch (100 psi).

3.4 CONCRETE

A. Concrete mix design.

1. Each Type of Concrete shall have one (1) mix design and shall be submitted so that the City's Project Manager can send to the Independent Testing Laboratory for review a minimum of seven days (7 D) before start of concrete placement. Concrete mix designs shall conform with requirements of ASTM C94.

2. Concrete Classification shall conform to TABLE 4.1 CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS in this Section. Coarse aggregate shall conform with ASTM C33 and as specified in TABLE 4.2 COARSE AGGREGATE GRADATION in this Section.

3. Fine aggregate shall conform with ASTM C33 and as specified in TABLE 4.3 FINE AGGREGATE GRADATION in this Section.

4. Mineral filler shall only be added with the approval of the Director of Community Development and shall not exceed fifteen percent (15%) of the fine aggregate weight and conforms to TABLE 4.4 MINERAL FILLERS in this Section.

5. Admixtures shall conform to the following:

   a. Water reducers shall conform to ASTM C494, type A.

   b. Water reducing retarders shall conform to ASTM C494, type D.

   c. High range water reducers (superplasticizers) shall conform to ASTM C494, Types F and G.

6. Water shall be potable.

7. Air entrainment shall be in accordance with ASTM C260 and shall be four percent (4%) plus or minus one percent (±1%).

B. Form Inspection.

1. Concrete Form inspection the City's Project Manager shall inspect the forms for uniformity and bracing.

2. All forms shall be cleaned free of all dried concrete, mud or any other deleterious material.

3. Non-petroleum based form oil may be used to coat the forms that will be in contact with concrete.

4. Wood forms shall be properly seasoned, of good quality and free of imperfections that may affect its strength or impair the finished surface of the concrete.

C. Reinforcing Bar Inspection.

1. The City's Project Manager shall inspect all reinforcing bar for conformity to CFTS Section 03200 Reinforcing Steel.

2. Reinforcing bars shall be placed according to the Drawings, the City of Friendswood Standard Details and the City of Friendswood Technical Specifications.

3. The minimum size of reinforcing bar shall be #4 [one-half inch (1/2 In)] and the minimum spacing shall be sixteen inches (16 In) on center unless otherwise approved by the City's Project Manager.

4. Reinforcing bars shall be one hundred percent (100%) tied at all ends, and fifty percent (50%) tied for the interior of the mat.

5. Splices shall have a minimum of twenty-four inches (24 In) overlapping.

6. Chairs are to be installed so that rebar is no closer from the top than one-third (1/3) of the depth of concrete being placed.

7. Chairs shall be placed at every other bar and under the lowest rebar for support and placed in a checkerboard pattern.

D. Placement of Concrete.

1. Independent Testing Laboratory shall be on site at all times. The City's Project Manager shall be on site as long as deemed necessary.

2. Placement of concrete shall not be allowed when ambient temperature is below forty degrees Fahrenheit (40° F) or above ninety-five degrees Fahrenheit (95° F) and conform to TABLE 4.5 TEMPERATURE REQUIREMENTS FOR PLACEMENT in this Section.

3. Materials shall not exceed eight percent (8%) moisture at the plant.

4. Travel time from batch time at plant to dispersal shall not exceed ninety minutes (90 Min) and conforming to TABLE 4.6 TRANSPORTING TIME REQUIREMENTS.

5. Time between trucks, end of last truck placement to beginning of next truck placement shall not exceed sixty minutes (60 Min); otherwise a construction joint shall be installed.

6. Verify the mix design for each truck is the mix design being used.

7. Verify tare weight to actual weights.

   a. Actual weights shall be within plus or minus one percent (±1%) of the tare weight.

   b. Admixtures shall be within plus or minus one gallon (±1 Gal) of tare.

8. Water tank on truck shall be full when arriving on site and shall have a readable and accurate measuring gauge attached to the tank.

9. Minimum drum rotations shall be between fifty (50) and seventy (70) before and during transport.

10. Minimum drum rotation shall be between seventy (70) and one hundred (100) arriving at the site and before discharge of concrete.

11. Slump shall be from three inches (3 In) to five inches (5 In) unless plasticizers are introduced to concrete and otherwise approved by the City's Project Manager.

12. Concrete temperature shall not drop below fifty degrees Fahrenheit (50° F) or rise above ninety degrees Fahrenheit (90° F). If ice is added to the mixture as part of the water content, then concrete temperature shall be allowed to rise above ninety degrees Fahrenheit (90° F) but no higher than ninety-five (95) degrees F as conforming to TABLE 4.5 TEMPERATURE REQUIREMENTS FOR PLACEMENT and ASTM C1064.

13. Slump tests shall be taken in conformance with ASTM C143 at every fifty cubic yards (50 Cy) of concrete. When ambient temperature is above ninety degrees Fahrenheit (90° F), then slump tests shall be taken on every thirty cubic yards (30 Cy) of concrete.

14. Air entrainment above five percent (5%) and below seven percent (7%), as tested in conformance with ASTM C173 or ASTM C231, may be approved for placement at the discretion of the City's Project Manager, and only accepted after the concrete has passed the twenty-eight day (28 D) compressive strength requirements.

15. Concrete that has air entrainment lower than two percent (2%) or higher than seven percent (7%), as tested in conformance with ASTM C173 or ASTM C231 shall be rejected and shall be remove concrete from site.

16. One (1) set of four (4) concrete cylinders in conformance with ASTM C31 for compressive strength test shall be made for every one hundred cubic yards (100 Cy) or portion there of placed in the day. Concrete placements less than one hundred cubic yards (100 Cy) in a day shall be tested at the discretion of the City's Project Manager.

17. Two (2) cylinders shall be tested in conformance of ASTM C39 at the age of seven days (7 D). The average of the two (2) tests shall be a minimum of seventy percent (70%) of designed twenty-eight day (28 D) strength.

18. Two (2) cylinders shall be tested in conformance of ASTM C39 at the age of twenty-eight days (28 D). The average of the two (2) tests shall equal or exceed the design strength.

19. No more that two gallons of water per cubic yard (2 Gal/Cy) shall be introduced into the truck at the job site. After addition of any water at the site, the truck drum shall make twenty-five (25) revolutions before placement can commence.

20. Water added after sampling for testing shall void air entrainment, slump and compressive strength tests that may have been completed before the addition of water. New sample of concrete shall be taken and testing started over again. NO EXCEPTIONS. If after warning the Contractor the condition continues to happen, and the practice continues, the Contractor shall be charged for failed tests.

21. The City's Project Manager and the Independent Testing Laboratory Technicians have the authority to reject any concrete load not matching the City of Friendswood Technical Specifications.

22. Load tickets shall be marked rejected, state reason, along with date and time and be signed by the City's Project Manager or Independent Testing Laboratory Technician.

3.5 DETENTION POND

A. Inspect for erosion around inflow/outflow areas and banks.

B. Area surrounding all drainage ditches, retention and detention ponds shall have turf established at a minimum cover of ninety percent (90%) as required by CFTS Section 02900 Turf Establishment.

C. The drainage areas shall have either Galveston County Consolidated Drainage District (GCCDD) or Harris County Flood Control (HCFC) approval before requesting the City's Project Manager for inspection and approval. These inspection may be done simultaneously.

3.6 SANITARY SEWER MANHOLES

A. Verify that all debris and water is removed from the interior of the manhole being tested and any grout has dried for a minimum of twenty-four hours (24 Hrs).

B. Insert plugs in influent and effluent pipes. Plugs are to be installed a minimum of six inches (6 In) past the exterior wall of the manhole being tested.

C. Inflate plugs to manufacturer's recommended air pressure.

D. Inspect testing head. Verify that a gauge exists on the head and that all openings through the head are open, not sealed, with check ball valves.

E. Install Vacuum testing head on ring of manhole. Testing head shall have a readable gauge that measures inches of mercury by inches.

F. Begin evacuation of air from manhole. Turn pump off when the gauge reads ten inches of mercury (10 InHg).

G. Softly tap gauge to ensure the gauge is not stuck.

H. Hold vacuum for minimal time as required in TABLE 4.7 VACUUM TESTING TIME TABLE in this Section.

I. After minimal time is complete, tap gauge twice. If the loss of mercury is one inch (1 In) or less the manhole is considered to have passed.

3.7 SANITARY SEWER FORCE MAINS

A. Testing for High Density Polyethylene (HDPE) Pipe shall be in accordance with paragraph 3.11 of this Section.

B. Hydrostatic Testing.

1. Plug both ends of pipe to be tested.

2. Provide a gauge with a range from zero pounds per square inch (0 psi) to three hundred pounds per square inch (300 psi), graduated in five pounds per square inch (5 psi) increments and is a minimum of three inches (3 In) in diameter. Provide a water tank and a water meter.

3. Fill pipe with water and pressure to either one hundred fifty (150 psi) or one and one-half (1.5) times the design pressure, whichever is greater.

4. Hold pressure for minimum of four hours (4 Hrs).

5. If pressure has held for four hours (4 Hrs), the pipe has passed.

6. If pressure has lost pressure, calculate the maximum allowed loss of water using the following formula.

$$4L = \frac{(S)(D)(P_{0.5})}{133{,}200}$$

7. Pressure pipe back up to one hundred fifty (150 psi), and record number of gallons required to achieve pressure. If less than or equal to 4L, then pipe is considered to have passed.

C. Pigging Test

1. Pigging test shall be conducted on force mains longer than two hundred feet (200 Ft).

2. Pig shall be open-cell polyurethane with no abrasives or coatings.

3. Pigs shall be capable of passing through reductions of up to sixty-five percent (65%) of nominal cross-section of pipe being tested.

4. Pigs shall be capable of passing through all standard fittings.

5. If pig passes through line being tested, the line is clear of obstructions and is considered to have passed.

3.8 SANITARY SEWER GRAVITY LINES

A. Low Pressure Air Test.

1. Low pressure air test shall conform to ASTM C828, ASTM C924 or ASTM F1417.

2. Clean both ends of pipe free of debris and water.

3. Install and inflate testing balls to manufacturer's recommended air pressure.

4. Pressure gravity sanitary sewer line to five pounds per square inch (5 psi) and hold for the minimum time as specified in TABLE 4.9 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI in this Section.

5. For lengths longer than the minimum time multiply additional lengthy by factor as specified in CFTS Section 02525 Table 4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI.

6. If test pressure drops below four pounds per square inch (4 psi) before the minimal testing time has been achieved then the test is considered to have failed. The Contractor shall make repairs as necessary and schedule a retest.

B. TV INSPECTION

1. One week (1 Wk) prior to mandrel test, sewer lines shall be cleaned and a TV inspection completed on each line, from upstream to downstream end.

C. MANDREL TEST

1. Mandrel testing shall conform to ASTM D3034.

2. No mandrel test shall be performed until after the gravity sanitary sewer has been installed for a minimum of thirty days (30 D).

3. Install mandrel pull string from manhole to manhole. Pull string shall not exceed three-eighths inch (3/8 In) thick nylon rope for pulling the mandrel.

4. Inspect mandrel size using proving ring provided. Proving ring shall fit snug over the mandrel. Verify that the mandrel is the correct size for the pipe being tested.

5. Once the mandrel is placed in the upstream pipe, slowly pull mandrel to the next manhole. Mandrel shall be pulled in the manhole by one (1) person. Mechanical equipment shall not be allowed to pull the mandrel through the pipe.

6. When mandrel reaches next manhole, mandrel shall be lifted and shown to the City's Project Manager. Mandrel shall never be pulled straight through a manhole, no exceptions.

7. If mandrel gets stuck in the pipe being tested, remove the mandrel and correct defects to the pipe and retest.

D. SMOKE TEST

1. Smoke test shall only by used on existing sanitary sewers that have been repaired or rehabilitated.

2. Only test from one (1) manhole to one (1) manhole section at a time.

3. Residents shall be notified no fewer that two days (2 D) and nor more than seven days (7 D) before smoke testing is scheduled to take place.

4. Public Works, Police Department, Fire Department and Notification Contacts shall be notified twenty-four hours (24 Hrs) prior to actual smoke testing.

5. Isolate section gravity sanitary sewer line to be tested at each manhole.

6. Introduce smoke into one (1) or both manholes. Operate smoke generator for a minimum of five minutes (5 Min).

7. Inspect all service line connections at the gravity sanitary sewer main for leaks. Repair and retest all leaks.

8. Visually inspect each house on the line being tested. Look for smoke coming through the plumbing vent stack on each house.

9. Any house that does not have smoke coming through the plumbing vent stack shall be checked for proper connection to the gravity sanitary sewer line being tested. Method of checking for proper connection shall be to introduce dye into the service line system at a point on landowner's property, and visually watch for dye to exit into downstream manhole. If no dye is seen, repair and retest service connection.

3.9 SUBGRADE

A. Lime Determination and Atterberg Limits

1. Have Independent Testing Laboratory obtain a representative sample of material.

2. Conform to ASTM D4318 to determine Liquid Limit, Plastic Limit and Plasticity Index.

3. Conform to ASTM D698 for Lime Determination. Minimum Lime content shall be no less than six percent (6%).

4. Make Lime Determination for soil to bring soil to a PI of no more than fifteen (15).

B. Lime Solids Test

1. Lime Solids test shall conform to TxDOT Tex-600-J.

2. Take sample from back of distributor truck.

3. Weigh and calculate samples for Dry Solids as specified in TxDOT Tex-600-J.

C. Gradation Test

1. Immediately after the re-mix of the lime-stabilized subgrade and before lime-stabilized subgrade is compacted, conform to TxDOT Tex-101-E, Part III dry method requirements for testing subgrade using sieve analysis.

2. Three (3) random samples shall be taken and tested for every six hundred linear foot (600 Lf) of roadway section or portion thereof for day's production.

3. Locations of the sample areas shall be determined by the City's Project Manager and shall vary from left, center and middle of roadway being tested.

4. Samples shall be a representative sampling of the lime-stabilized subgrade.

5. All three (3) samples must pass sieve analysis. If any one sample fails then the Contractor shall rework the roadway section tested and have it retested at no cost to the City.

6. Immediately after the roadway section has passed the sieve analysis, the Contractor shall commence to compaction of subgrade.

D. Compaction

1. Notify the City's Project Manager a minimum of forty-eight hours (48 Hrs) before testing for compaction.

2. The City's Project Manager shall identify the locations for all density testing.

3. Compaction shall be a minimum of ninety-five (95%) of dry density and moisture shall be at optimum plus or minus three percent (±3%).

4. There shall be only two (2) tests performed in any one (1) hole at one (1) time to achieve density readings. Moving the Nuclear Density Gauge around more that this shall fail the whole work area being tested.

5. Three (3) density tests per lane shall be performed on every two hundred linear feet (200 Lf) of roadway.

6. After one inch (1 In) or more of documented rainfall, subgrade shall be retested and shall conform to 3.9.D.3 and 3.9.D.4.

7. After one inch (1 In) or more of rain, every five hundred feet (500 Ft) per lane of roadway shall be tested.

8. Stipulations in 3.9.D.6 and 3.9.D.7 shall be reinstituted after each additional one inch (1 In) of rainfall until paving has been placed.

E. In-place Depth Test

1. Contractor shall notify the City's Project Manager a minimum of forty-eight hours (48 Hrs) prior to the start of testing.

2. In place depth test for lime-stabilization shall conform to TxDOT Tex-140-E.

3. Tests shall be taken in hand excavated holes only. NO EXCEPTIONS.

4. Three (3) samples shall be taken for each one thousand foot (1000 Ft) section of subgrade place per lane.

5. Depth shall be based on the average of all three (3) samples from the section being tested.

6. Failing sections shall be remixed and recompacted with correct amount of subgrade in place.

3.10 WATER LINES

A. Bacteriological Test (BAC-T)

1. The Contractor shall notify the City's Project Manager at least forty-eight hours (48 Hrs) in advance of testing. All testing shall conform to TCEQ and TDSHS. NO EXCEPTIONS.

2. The City's testing collection times shall be at 10:00 a.m. on Tuesdays and Thursdays only. NO EXCEPTIONS.

3. Water line shall have been thoroughly flushed prior to and at least on the day of the scheduled testing.

4. The City's Public Works Department personnel shall open the valves and collect the samples.

5. There shall be one (1) BAC-T taking for every one thousand linear feet (1000 Lf) of pipe installed. Any linear footage, no matter the amount, over one thousand linear feet (1000 Lf) shall require another BAC-T for that portion.

6. The City's Project Manager shall identify and mark the locations of the BAC-T's to be taken.

7. Maximum testing length shall be no more than four thousand linear feet (4000 Lf) at one (1) given testing day.

8. Optimum chlorine content for testing shall be from one part per million (1.0 ppm) to no more than four and one-half parts per million (4.5 ppm). Water lines having chlorine level above five parts per million (5.0 ppm) shall not be tested and shall be flushed until the chlorine is in the acceptable range.

9. If the water lines have not been isolated for testing purposes, then all tests taken shall come back negative. One (1) positive test on non-isolated lines is a failure of the whole line being tested and BAC-T's for the entire line shall be retaken.

10. After two (2) failed BAC-T's the Contractor shall re-chlorinate and flush the failing water line.

11. The Contractor may, upon the approval of the City's Project Manager, take samples and use an alternate lab provided that the following conditions are met:

    a. Project Manger shall be present at all times during the testing process.

    b. The alternate lab shall be qualified and recognized under TCEQ and TDSHS rules and regulations.

    c. Laboratory shall send a representative of their company to pick up samples. The Contractor shall not transport the samples to the laboratory. Chain of custody shall be maintained by the laboratory's personnel.

    d. Copies of all reports shall be sent immediately from the lab to the City's Project Manager.

B. Testing for High Density Polyethylene (HDPE) Pipe shall be in accordance with paragraph 3.11 of this Section.

C. Hydrostatic Test of Water Lines

1. The Contractor shall notify the Project Manger a minimum of forty-eight hours (48 Hrs) before testing.

2. Hydrostatic Testing shall conform to American Water Works Associations' Manual M-23, latest revision.

3. The Contractor shall supply all pumps, gauges, meters and other equipment necessary to perform the test procedures. Testing gauge shall measure pressure in five pounds per square inch (5 psi) increments.

4. One (1) test shall be taken for every one thousand linear feet (1000 Lf) of water line.

5. Fill the auxiliary tank full of water and using the pressure pump, pressurize the water line to one hundred fifty pounds per square inch (150 psi). [Dedicated Fire Lines shall be pressurized to two hundred pounds per square inch (200 psi)].

6. After gauge achieves one hundred pounds per square inch (150 psi), close valves and stop pump.

7. Softly tap the glass of the gauge. Start time of the test.

8. Test time shall be no less than a minimum of four hours (4 Hrs). [Dedicated Fire Lines shall be tested for no less than a minimum of two hours (2 Hrs)].

9. At the end of the test period, softly tap pressure gauge, if needle does not move then the line is considered to have passed.

10. Fill line back up with water and use the following water to calculate minimum allowed loss as calculated using the formula below:

$$L = \frac{4NDP^{1/2}}{7400}$$

11. If amount of gallons lost is less than that calculated, then the test is considered to have passed.

3.11 Hydrostatic Testing of High Density Polyethylene (HDPE) Pipe in Pressurized Systems.

A. Restraint.

1. All valves, tees elbows and dresser couplings shall be

restrained with stainless steel all thread.

2. Test gauge shall be installed at the lowest point in the test section.

B. Pipe filling:

1. Quantity of liquid needed to fill the internal volume of the pipe test section shall be estimated using the following formula:

$$V_{GAL} = 0.04 \times ID_{IN}^2 \times L_{FT}$$

where:

a. V_{GAL} = pipe section volume in U.S. gallons

b. ID_{IN} = pipe inside diameter in inches

c. L_{FT} = test section length in feet

2. An appropriate excess quantity of liquid, up to forty percent (40%), may be needed to account for pipe expansion and possibility of leakage.

3. Fill test section of pipe slowly, allowing all air to be purged from the pipe.

4. Allow the test section and the test liquid to equalize in temperature.

C. Initial Expansion Phase.

1. Expansion Phase can take up to, but shall be no longer than, four hours (4 H).

2. Slowly pressurize the test section to test pressure, one hundred-fifty pounds per square inch (150 PSI), and maintain for three hours (3 H). During the initial expansion phase the polyethylene pipe will expand slightly. Additional test liquid will be required to maintain test pressure.

D. Testing Phase

1. Immediately following the initial expansion phase, monitor the amount of liquid required to maintain test pressure (150 psi) for one hour (1 H).

2. If the amount of liquid does not exceed the amount listed in TABLE 4.10 MAKE-UP WATER ALLOWANCE, then no leakage is detected and the test section a passing test is indicated.

3. Should the test fail and retesting become necessary, depressurize test section in accordance with paragraph 3.11.E.

   a. Do not attempt to correct faults or leaks until after test section is completely depressurized.

   b. A minimum relaxation period of eight hours (8 H) shall be observed before re-pressurization. After relaxation period, retest starting with the initial expansion phase.

E. Post Test Procedures.

1. At the conclusion of the test, test section shall be depressurized by a controlled release of the test fluid. The potential of a pressure surge is avoided by a controlled release.

PART IV: TABLES

4.1 CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS

CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS					
Class of Concrete	***Sacks of Cement per Cubic Yard Minimum***	***Minimum Compressive Strength at 28 Days***	***Maximum Cement to Water Ratio***	***Coarse Aggregate Grade Number***	***Slump***
A	***5.0***	***3000***	***6.25***	***2 □ 3***	***3 □ 5****
B	***6.0***	***3600***	***6.00***	***1,2,3,4,5***	***4***
C	***4.0***	***2000***	***8.00***	***2,3,4,5,6,7***	***5***
D	***6.0***	***3000***	***6.00***	***2,3,4,5***	***5***
E	***6.0***	***As specified***	***5.50***	***3,4,5,6***	***5***
F	***8.75***	***5500***	***3.6***	***6***	***5***

****When ASTM C494, Type F or Type G admixture is used to increase workability, this range may be 6 to 9.***

4.2 COARSE AGGREGATE GRADATION

COARSE AGGREGATE GRADATION CHART										
Aggregate Grade No.	Nominal Size Inches	Percent Retained on Each Sieve								
		2-1/2 In.	2 In.	1-1/2 In.	1 In.	3/4 In.	1/2 In.	3/8 In.	No. 4	No. 8
1	2	0	0-20	15-50		60-80			95-100	
2 (467)*	1-1/2		0	0-5		30-65		70-90	95-100	
3	1-1/2		0	0-5		10-40	40-75		95-100	
4 (57)*	1			0	0-5		40-75		90-100	95-100
5 (67)*	3/4				0	0-10		45-80	90-100	95-100
6 (7)*	1/2					0	0-10	30-60	85-100	95-100
7	3/8						0	5-30	75-100	
8	3/8						0	0-5	35-80	90-100

**** Numbers in parenthesis indicate that the gradations conform to Corresponding ASTM gradation in ASTM C33.***

4.3 FINE AGGREGATE GRADATION

FINE AGGREGATE GRADATION CHART								
Aggregate Grade No.	Percent Retained on Each Sieve							
	3/8 In.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
1	0	0-5	0-20	15-50	35-75	65-90	90-100	97-100

4.4 MINERAL FILLERS

MINERAL FILLER GRADATION CHART		
Percent Retained on Each Sieve		
No. 20	No. 30	No. 100
0 %	0 to 5 %	0 to 30 %

4.5 TEMPERATURE REQUIREMENTS FOR PLACEMENT

PLACEMENT TEMPERATURE REQUIREMENTS	
AMBIENT TEMPERATURE[1]	
Minimum temperature to start placing concrete	35° and rising
Minimum temperature to stop placing concrete	40° and falling
Maximum temperature for placing concrete without ice	90°
Maximum temperature for placing concrete with ice	100°
CONCRETE TEMPERATURE	
Minimum concrete temperature	50°
Maximum concrete temperature without ice	90°
Maximum concrete temperature with ice	95°
MINIMUM CURING TIMES WHEN PLACED CONCRETE HASS BEEN EXPOSED TO FREEZING TEMPERATURES	
From 50° to 70°, minimum days	5
70° and above, minimum days	3
[1]Ambient temperature is to be taken as specified in paragraph 3.3.F.1 of this section.	

4.6 TRANSPORTING TIME REQUIREMENTS

TRANSPORTING TIME REQUIREMENTS FOR PLACEMENT		
Ambient Temperature	Maximum Time (No Retarding Agent) in Minutes	Maximum Time (With Retarding Agent) in Minutes[1]
Non-Agitated Concrete		
Above 80° F	15	30
80° F and Below	30	45
Agitated Concrete		
Above 90° F	45	75
75° F to 90° F	60	90
75° F and Below	90	120
NOTE: Time interval shall be from the addition of cement to the batch to start of placement of concrete in the forms. [1]Normal Dosage of retarder.		

4.7 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI

Pipe Dia. In.	Min. Time mm:ss	Length for Min. Time	Time for Longer Length	Specification Time for Length (L) shown in MM:SS				
				100'	150'	200'	250'	300'
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17

Pipe Dia. In.	Min. Time mm:ss	Length for Min. Time	Time for Longer Length	Specification Time for Length (L) shown in MM:SS					
				350'	400'	450'	500'	550'	600'
6	5:40	398	0.8548	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	8:52	10:08	11:24	12:08	13:56	15:12
10	9:27	239	2.3743	13:51	15:50	17:48	19:47	21:46	23:45
12	11:20	199	3.4190	19:57	22:48	25:39	28:30	31:20	34:11
15	14:10	159	5.3423	31:10	35:37	40:04	44:31	48:58	53:25
18	17:00	133	7.6928	44:52	51:17	57:42	64:06	70:31	76:56
21	19:50	114	10.4708	61:05	69:48	78:32	87:15	95:59	104:42
24	22:40	99	13.6762	79:47	91:10	102:34	113:58	125:22	136:46
27	25:30	88	17.3089	100:58	115:24	129:49	144:14	158:40	173:05
30	28:20	80	21.3690	124:39	142:28	160:16	178:05	195:53	213:41
33	31:10	72	25.8565	150:50	172:23	193:55	215:28	237:01	258:34

4.8 VACUUM TESTING TIME TABLE

TIME ALLOWED FOR VACUUM LOSS FROM 10.0 Hg TO 9.0 Hg			
	TIME IN SECONDS BY DIAMETER OF MANHOLES		
Manhole Depth in Feet	48 Diameter	60 Diameter	72 Diameter
8' and less	14	18	23
10	17	23	28
12	21	28	34
14	25	32	40
16	28	37	45
18	23	41	51
20	35	46	57
22	39	51	62
24	42	55	68
26	46	60	74
28	49	64	80
30	53	69	85

4.9 MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

Pipe Diameter (Inches)	Minimum Time (seconds)	Length of Pipe for Minimum Time (feet)	Time for Longer Length (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	99	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	258.856 (L)

4.10 MAKE-UP WATER ALLOWANCE

Nominal Pipe Size (Inches)	Allowable Gallons per 100 Feet of Pipe	Nominal Pipe Size (Inches)	Allowable Gallons per 100 Feet of Pipe
1-1/4	0.06	12	1.1
1-1/2	0.07	14	1.4
2	0.07	16	1.7
3	0.10	18	2.0
4	0.13	20	2.8
5	0.21	22	3.5
6	0.3	24	4.5
8	0.5	26	5.0
10	0.8	28	5.5

END OF SECTION

SECTION 01500

MOBILIZATION

PART I: GENERAL

1.1 GENERAL REQIREMENTS

A. Mobilization of construction equipment and facilities onto the site.

1.2 MEASUREMENT AND PAYMENT

A. Unit Price Contracts: If Contract is Unit Price Contract, measurement for mobilization is on a lump sum basis.

B. Total Stipulated Price (Lump Sum) Contract: If Contract is Total Stipulated Price Contract, payment for the Work in this Section is included in Total Stipulated Price.

C. Mobilization payments will be included in monthly payment estimates upon written application by the Contractor subject to the following provisions:

1. Authorization for payment of fifty percent (50%) of that portion of the Contract Price designated for mobilization will be made upon receipt and approval by the Project Manager of the following items, as applicable:

   a. Safety Program (Section 00500 General Conditions).

   b. Schedule of Values (Section 01295 Schedule of Values).

   c. Initial Construction Photographs (Section 01320 Construction Photographs).

   d. Construction Schedule (Section 01325 Construction Schedule).

   f. Submittal Schedule (Section 01330 Submittal Procedures).

   g. Site specific Storm Water Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) along with storm water application fee (Section 01410 TPDES Requirements).

h. Contractor's Quality Control Plan (Section 01450 – Contractor's Quality Control).

i. Establishment of a Field Office for the Project Manager meeting requirements of Section 01520 – Temporary Field Office, when an office is required by the Contract.

j. Traffic Control Plan (Section 01555 – Traffic Control and Regulation).

k. Plan for Control of Ground and Surface Water (Section 01585 – Control of Ground and Surface Water).

l. Project Signs Submittal (Section 01430 – Project Signage).

m. Trench Safety Program (Section 02280 – Trench Safety Systems).

n. Dewatering Plan, when required.

2. Authorization for payment of the balance of that portion of the Contract Price designated for mobilization will be made upon completion of the Work amounting to five percent (5%) of the Original Contract Price. The amount of the Contract Price designated for mobilization may not be applied in computing whether or not five percent (5%) of the Original Contract Price has been obtained.

3. Mobilization payments will be subject to retainage amounts stipulated in Document 00400 – Standard Agreement of Contracting Services, Article VI.

1.3 REFERENCES

A. CFTS – City of Friendswood Technical Specifications.

1. Document 00400 – Standard Agreement for Contracting Services.

2. Section 00500 – General Conditions.

3. Section 01295 – Schedule of Values.

4. Section 01320 – Construction Photographs.

5. Section 01325 □ Construction Schedule.
6. Section 01330 □ Submittal Procedures.
7. Section 01410 □ TPDES Requirements.
8. Section 01430 □ Project Signage.
9. Section 01450 □ Contractor's Quality Control.
10. Section 01520 □ Temporary Field Office.
11. Section 01555 □ Traffic Control and Regulation.
12. Section 01585 □ Control of Ground and Surface Water.
13. Section 02280 □ Trench Safety Systems.

PART II: PRODUCTS □ NOT USED.

PART III: EXECUTION □ NOT USED.

END OF SECTION

SECTION 01505

TEMPORARY FACILITIES AND CONTROLS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Temporary facilities and necessary controls for the Project, including utilities, telephone, sanitary facilities, storage sheds and building, safety requirements, first aid equipment, fire protection, security measures, protection of the Work and property, access roads and parking, environmental controls, pest and rodent control and disposal of trash, debris and excavated material.

B. Facilities and controls specified in this Section are considered minimum for the Project. Provide additional facilities and controls for proper execution of the Work and to meet the Contractor s responsibilities for protection of persons and property.

1.2 CONTRACTOR S RESPONSIBILITY

A. Comply with applicable requirements specified in other sections of the Technical Specifications.

1. Maintain and operate temporary facilities and systems to assure continuous service.

2. Modify and extend systems as the Work progress requires.

3. Completely remove temporary materials and equipment when no longer required.

4. Restore existing facilities used for temporary services to specified or original condition.

1.3 REFERENCES

A. CFCO City of Friendswood Code of Ordinances.

1. Chapter 54, Article IV Noise.

B. CFR Code of Federal Regulations.

1. CFR 29 Part 1926 Safety and Health Regulations for Construction.

C. CFTS City of Friendswood Technical Specifications.

1. Section 00500 General Conditions.

2. Section 01140 Work Restrictions.

3. Section 01410 TPDES Requirements.

4. Section 01555 Traffic Control and Regulation.

5. Section 02280 Trench Safety Systems.

D. TOSA Texas Occupational Safety Act.

1. Texas Occupational Safety Act Article 51 82a, V.C.S.

PART II: PRODUCTS NOT USED.

PART III: EXECUTION

3.1 TEMPORARY UTILITIES

A. Obtaining Temporary Service:

1. Make arrangements with utility service companies for temporary services.

2. Abide by rules and regulations of the utility service companies or authorities having jurisdiction.

3. Be responsible for utility service costs until Date of Substantial Completion. Included are fuel, power, light, heat, and other utility services necessary for execution, completion, testing, and initial operation of the Work.

B. Water:

1. Provide water required for and in connection with work to be performed and for specified tests of piping, equipment, devices, or for other use as required for proper completion of the Work.

2. Water to be drawn from public fire hydrants. Obtain transit meter from City of Friendswood, Department of Public Works. Pay required deposit.

3. Provide and maintain an adequate supply of potable water for domestic consumption by the Contractor's personnel, the Project Manager and representatives of the City.

C. Electricity and Lighting:

1. Provide electric power service required for the Work including required testing, lighting, operation of equipment, and other Contractor use.

2. Electric power service includes temporary power or generators required to maintain plant operations during scheduled shutdowns.

3. Minimum lighting level shall be ten foot-candles (10 fc) for open areas; twenty foot-candles (20 fc) for stairs and shops. Provide a minimum of one (1) three hundred watt (300w) lamp for each two hundred square feet (200 Sf) of work area.

D. Temporary Heat and Ventilation:

1. Provide temporary heat necessary for protection or completion of the Work.

2. Provide temporary heat and ventilation to assure safe working conditions; maintain enclosed areas at a minimum of fifty degrees Fahrenheit (50° F).

E. Telephone:

1. Provide emergency telephone service at the Project site for use by the Contractor's personnel and others performing work or furnishing services at the site.

2. Provide Houston-Metro lines, allowing unlimited calls, without charge in Greater Houston Metropolitan area with "call waiting" and "call forwarding" options. Provide one (1) telephone answering machine with beeperless remote message retrieval capability.

F. Sanitary Facilities:

1. Provide and maintain sanitary facilities for persons on the site; comply with regulations of State and local departments of health.

2. Enforce use of sanitary facilities by construction personnel at

site. Enclose sanitary facilities. Pit-type toilets are not permitted. No discharge will be allowed from these facilities. Collect and store sewage and waste so as not to cause nuisance or health problems. Haul sewage and waste off-site and properly dispose in accordance with applicable regulations. Sewage shall not be disposed of on-site, buried or introduced into the Storm Water System.

3. Locate portable toilets near the Work site and secluded from view insofar as possible. Portable toilets shall be installed on level ground, twenty feet (20 Ft) away from nearest downslope stormdrain inlet and shall be a minimum of eleven feet (11 Ft) behind curbs or top slopes of open ditch streets.

4. Portable toilets shall have a secondary containment system, either a containment pan or berm with ten (10) mil polyethylene. Portable toilets shall be secured to the ground so as not to tip over during windstorms. All spillage shall be pumped out immediately.

5. Keep portable toilets clean and supplied throughout the course of the Work. Portable toilets shall be transported to and from site, maintained and sewage hauled by a Contractor licensed by the State of Texas. All facilities shall be checked weekly and shall have services dates, owner identification and contact information in a prominent place.

3.2 STORAGE SHEDS AND BUILDINGS

A. Provide adequately ventilated, watertight storage facilities with floor above ground level for Products susceptible to weather damage.

B. Storage of Products not susceptible to weather damage may be on blocks off the ground.

C. Store Products in a neat and orderly manner. Place Products to permit easy access for identification, inspection and inventory.

D. Fill and grade site for temporary structures to provide drainage away from temporary and existing buildings.

3.3 SAFETY REQUIREMENTS

A. Submit a safety program at the pre-construction meeting and follow the program in accordance with Section 00500 □ General Conditions. Include documented response to trench safety requirements of Section 02280 □ Trench Safety System.

B. Conduct operations in strict accordance with applicable Federal, State and local safety codes and statutes and with good construction practice. Establish and maintain procedures for safety of all work, personnel and equipment involved in the Work.

C. Observe and comply with Texas Occupational Safety Act (Art. 51 82a, V.C.S.) and with all safety and health standards promulgated by Secretary of Labor under Section 107 of Contract Work Hours and Standards Act, published in 29 CFR Part 1926 and adopted by Secretary of Labor as occupational safety and health standards under Williams-Steiger Occupational Safety and Health Act of 1970, and to other legislation enacted for safety and health of the Contractor employees. Safety and health standards apply to Subcontractors and Suppliers as well as to the Contractor.

D. Observance of and compliance with safety regulations is the Contractor's responsibility without reliance or superintendence of or direction by the Project Manager. Immediately advise the Project Manager of investigation or inspection by Federal Safety and Health inspectors of the Contractor's or Subcontractor's work or place of work on site under the Contract, and after investigation or inspection, advise the Project Manager of results. Submit one (1) copy of accident reports to Project Manager within ten days (10 D) of occurrence.

E. Protect areas occupied by workmen using the best available devices for detection of lethal and combustible gases. Test devices frequently to assure functional capability. Constantly observe infiltration of liquids into the Work area for visual or odor evidence of contamination, and immediately take appropriate steps to seal off entry of contaminated liquids to the Work area.

F. Implement safety measures, including but not limited to safety personnel, first-aid equipment, ventilating equipment and other safety equipment specified or detailed on the Drawings.

G. Maintain required coordination with City Police and Fire Departments during entire period covered by the Contract.

H. Include Project safety analysis in safety plan. Itemize major tasks and potential safety hazards. Plan to eliminate hazards or protect workers and public from each hazard.

3.4 FIRST AID EQUIPMENT

A. Provide a first aid kit throughout the construction period. List telephone numbers for physicians, hospitals, and ambulance services in each first

aid kit.

B. Have at least one (1) person thoroughly trained in first aid and CPR procedures present on the site when work is in progress. The Contractor shall conform to protocols and requirements for training and protection against "blood borne pathogens".

3.5 FIRE PROTECTION

A. Conform to specified fire protection and prevention requirements established by Federal, State, or local governmental agencies and as provided in Safety Program.

3.6 SECURITY MEASURES

A. Protect the Work, materials, equipment, and property from loss, theft, damage, or vandalism. Protect the City property used in performance of the Contract.

B. If existing fencing or barriers are breached or removed for purposes of construction, provide and maintain temporary security fencing equal to existing.

3.7 PROTECTION OF UTILITIES AND PIPELINES

A. Prevent damage to existing public utilities during construction. Approximate locations of known utilities are shown on the Drawings, but all lines may not be shown. Excavate with caution and repair lines damaged by construction operations.

B. Use the Utility Coordinating Committee One Call System, telephone number, (713) 223-4567, which must be called forty-eight hours (48 Hrs) in advance. The toll free telephone number is 1-800-669-8344, Texas One Call System.

1. City Utilities that need to be located shall be done so after notification of the Project Manager and the Department of Public works at (281) 996-3380.

C. Before excavating, locate underground utilities by appropriate means including the use of metal detection equipment, and probes, or by excavation or surveys. Repair damage caused by investigative work and by failure to locate or to preserve underground utilities.

D. Give utility owners a minimum five days (5 D) notice before commencing excavation to allow time to locate utilities and make adjustments or relocations when they conflict with the Work. Include

cost for temporary relocation of water, wastewater, and storm drainage lines, necessary to accommodate construction, in unit prices for utility construction unless otherwise noted. Bypassing of sanitary waste to storm drainage facilities is not allowed.

E. Prior to excavation near pipelines, request a representative of the pipeline company to meet with the Contractor and the Project Manager at the site to discuss procedures to be used. Request pipeline company's representative to locate the pipelines in at least three (3) locations: at each side and at centerline of proposed excavation of proposed utility. Also request representative and the Project Manager to be present to observe the Contractor's operations when excavation is conducted within fifteen feet (15 Ft) of pipeline.

3.8 PROTECTION OF THE WORK AND PROPERTY

A. Preventive Actions

1. Take necessary precautions and actions to prevent damage, injury, or loss to the Work or public and private property, including:

a. Storage of apparatus, supplies, and Products in an orderly, safe manner to limit interference with progress of the Work or work of other contractors, utility service companies, or the City's operations.

b. Suitable storage for Products subject to damage by exposure to weather, theft, breakage, etc.

c. Limitation of loading pressures imposed upon portions of the Work.

d. Frequent clean up of refuse, scrap materials, and debris from construction operations, necessary to maintain the site in a safe and orderly condition.

e. Provision of barricades and guard rails to protect pedestrian and traffic around openings, scaffolding, temporary stairs and ramps, excavations, elevated walkways, and other hazardous areas.

2. Protect public and private property adjacent to the site. Obtain written consent before entering or occupying privately-owned land except on easements provided for construction. Restore property damaged by construction operations to condition equal to or better than that existing before the damage.

B. Barricades and Warning Systems

1. Where work is performed on or adjacent to roadways, rights-of-ways, or public land, provide barricades, fences, lights, warning signs, danger signals, and other precautionary measures necessary for protection of persons or property and for protection of the Work.

   a. Erect sufficient barricades to keep vehicles and pedestrians from entering the Work. Paint barricades to be visible at night. From sunset to sunrise, provide at least one (1) light at each barricade.

   b. Maintain barricades, signs, lights, and provide watchmen until the Project Manager approves removal. Whenever work creates encroachment onto public roadways, station flagmen to manage traffic flow in accordance with approved traffic control plan.

   c. Conform to requirements of Section 01555 Traffic Control and Regulation.

C. PROTECTION OF EXISTING STRUCTURES

1. Underground Facilities

   a. Known Underground Facilities are shown on the Drawings but all Facilities may not be shown. Explore sufficiently ahead of trenching and excavation work to locate Underground Facilities in order to prevent damage to them and to prevent interruption of utility services. Restore damage to Underground Facilities to original condition at no additional cost to the City.

   b. If necessary to avoid unanticipated Underground Facilities, the Project Manager may make changes in location of the Work.

   c. If permanent relocation of an Underground Facility is required and not provided for in the Contract documents, the Project Manager shall direct the Contractor in writing to perform the Work under Modification provisions in Section 00500 General Conditions.

2. Surface Structures include buildings, tanks, walls, bridges,

roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks, guard cables, fencing, and other facilities that are visible above the ground level.

3. Protection of Underground Facilities and Surface Structures:

   a. Support in place and protect Underground Facilities and Surface Structures located within or adjacent to the limits of the Work from damage. Install supports as required by the owner of the structure. Satisfy the Project Manager that the owner of the facility or structure has approved methods and procedures before installing structure supports.

   b. Avoid moving or changing public utility or private corporation property without prior written consent of a responsible official of the facility or structure. Allow representatives of utilities to enter the construction site for maintenance and repair purposes or to make necessary changes.

   c. Notify utility and pipeline owners and operators of the nature of construction operations and dates when operations will be performed. When construction operations are required in immediate vicinity of existing structures, pipelines, or utilities, give a minimum of five working days (5 wD) advance notice. Probe and flag location of Underground Facilities prior to commencement of excavation. Keep flags in place until construction operations uncover the facility.

   d. Assume risk for damages and expenses to Underground Facilities and Surface Structures within or adjacent to the Work.

D. Employ a structural engineer to ensure protection measures are adequate for the safety and integrity of structures and facilities.

E. Protection of Installed Products:

1. Provide protection of Installed Products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of the Work.

2. Control traffic to prevent damage to Products and surfaces.

3. Provide coverings to protect Products from damage. Cover

projections, wall corners, jambs, sills, and exposed sides of openings in areas used for traffic and passage of materials in subsequent work.

3.9 ROADS AND PARKING

A. Prevent interference with traffic and operations of the City on existing roads.

B. Designate temporary parking areas to accommodate construction and the City personnel. When site space is not adequate, provide additional off-site Parking. Locate as approved by the Project Manager.

C. Minimize use by construction traffic on existing streets and driveways.

D. Do not allow heavy vehicles or construction equipment in existing parking areas.

3.10 ENVIRONMENTAL CONTROLS

A. Use methods, equipment, and temporary construction necessary for control of environmental conditions at the site and adjacent areas.

B. Comply with statutes, regulations, and ordinances relating to prevention of environmental pollution and preservation of natural resources including National Environmental Policy Act of 1969, PL 91-190, Executive Order 11514.

C. Minimize impact to the surrounding environment. Do not use construction procedures that cause unnecessary excavation and filling of terrain, indiscriminate destruction of vegetation, air or stream pollution, or harassment or destruction of wildlife.

D. Limit disturbed areas to boundaries established by the Contract. Do not pollute on-site streams, sewers, wells, or other water sources.

E. Do not burn rubbish, debris or waste materials.

3.11 POLLUTION CONTROL

A. Provide methods, means, and facilities necessary to prevent contamination of soil, water or the atmosphere by discharge of Pollutants from construction operations.

B. Provide equipment and personnel to perform emergency measures to contain spillage, and to remove contaminated soils or liquids. Excavate and dispose of contaminated earth off-site in accordance with laws and

regulations, and replace with suitable compacted fill and topsoil.

C. Provide systems necessary for control of Pollutants.

1. Prevent toxic concentrations of chemicals.

2. Prevent harmful dispersal of Pollutants into the environment.

D. Use equipment that conforms to current Federal, State, and local laws and regulations.

3.12 PEST AND RODENT CONTROL

A. Provide rodent and pest control as necessary to prevent infestation of construction or storage areas.

B. Employ methods and use materials that will not adversely affect conditions at site or on adjoining properties.

3.13 NOISE CONTROL

A. Provide vehicles, equipment, and use construction activities that minimize noise to the greatest degree practicable. Conform to noise levels of Chapter 54, Article IV Noise, City Code of Ordinances, and latest OSHA standards. Do not permit noise levels to interfere with the Work or create a nuisance to surrounding areas.

B. Conduct construction operations during daylight hours except as approved by the Project Manager as specified in Section 1140 Paragraph 1.13.

C. Select construction equipment that operates with minimum noise and vibration. When directed by the Project Manager, correct objectionable noise or vibration produced by operation of equipment at no additional cost to the City.

D. Sound Power Level (PWL) of equipment shall not exceed levels as specified in Chapter 54, Article IV, Section 54-95, City Code of Ordinances. Equipment noise requirements are contained in equipment specifications.

3.14 DUST CONTROL

A. Use water or other methods approved by the Project Manager to control amount of dust generated by vehicle and equipment operations.

3.15 WATER RUNOFF AND EROSION CONTROL

A. Comply with requirements of section 01410 -TPDES Requirements.

B. Conduct fill, grading and ditching operations and provide adequate methods necessary to control surface water, runoff, subsurface water, and water from excavations and structures in order to prevent damage to the Work, the site, or adjoining properties.

1. Plan and execute construction and earthwork by methods that control surface drainage from cuts and fills, and from borrow and waste disposal areas.

2. Minimize area of bare soil exposed at one (1) time.

3. Provide temporary control measures, such as berms, dikes, and drains.

4. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

5. Construct fill and waste areas by selective placement of materials to eliminate erosion of surface silts or clays that may erode.

6. Direct water away from excavations, pits, tunnels, and other construction areas to prevent erosion, sedimentation or damage.

7. Maintain existing drainage patterns adjacent to the site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover.

8. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to the site or adjoining areas, in conformance with environmental requirements.

9. Inspect earthwork periodically to detect any evidence of erosion. Take corrective measures as required to control erosion.

3.16 CONCRETE WASHOUT PITS

A. Temporary concrete washout facilities shall be located a minimum of fifty feet (50 Ft) from storm drain inlets, open drainage facilities and water courses. Each facility shall be located away from construction traffic or access to prevent disturbance or tracking.

B. A sign shall be installed to inform concrete equipment operators, truck drivers and finishers to utilize proper facilities.

C. Temporary washout facilities shall have a temporary pit or bermed area sufficient to completely contain all liquid and waste materials generated during the washout procedures.

D. Above grade washout area shall have a berm, with a base of straw hay bales staked with two (2) stakes per bale into the ground. The interior shall have a minimum of ten (10) mil polyethylene that shall be free of tears, holes or other defects. The minimum area of containment shall be ten foot by ten foot (10 Ft x 10 Ft) and shall have a minimum of four inches (4 In) of freeboard.

E. Below grade washout area shall be surrounded with sandbags on the inner perimeter and silt filter fabric fence on the exterior perimeter. The pit shall be lined with a minimum of ten (10) mil polyethylene and have a minimum of twelve inches (12 In) of freeboard.

F. All waste material shall be allowed to solidify before it is broken up and hauled off as specified in Section 01580 Waste Material Disposal.

END OF SECTION

SECTION 01510

DIVERSION PUMPING

PART I: GENERAL

1.1 DEFINITIONS

A. Diversion-pumping: Installation and operation of bulkheads, plugs, hoses, piping, and pumps required to maintain sewer flow and prevent backups and overflows.

1.2 SYSTEM DESCRIPTION

A. Provides continuous sewer service to users of sewer systems while maintenance or construction operations are in progress, by diverting flow around construction locations. Maintain sewer flow to prevent backup or overflow onto streets, yards and unpaved areas or into buildings, adjacent ditches, storm sewers, and waterways. Do not divert sewage outside of sanitary sewer system.

B. When pumps are operating, have an experienced operator on site to monitor operation, adjust pumps, make minor repairs to system, and report problems.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. For systems that bypass sanitary sewer line segments of forty-two inch (42 In) diameter or larger, submit a Diversion Pumping Plan prior to installation. Show location, number and size of pumps, number, location, size and type of hoses or rigid piping, and location of downstream discharge; and special features where pipes or hoses cross roadways, temporary trenches, support bridges.

1.4 SCHEDULING

A. When the City operates or maintains diversion pumping in construction areas, coordinate construction activities with the Project Manager.

B. Cease operation of diversion pumping when approved by the Project Manager.

1.5 REFERENCES

A. CFCO City of Friendswood Code of Ordinances.

1. Chapter 54, Article IV.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01330 Submittal Procedures.

C. EPA Environmental Protection Agency.

D. TCEQ Texas Commission on Environmental Quality.

PART II: PRODUCTS

2.1 MATERIALS

A. Design piping, joints and accessories to withstand at least twice maximum system pressure or fifty pounds per square inch (50 psi), whichever is greater.

B. Use self-priming type or submersible electric pumps, with a working pressure gauge on the discharge. Pumps shall meet requirements of City of Friendswood Noise Ordinance.

PART III: EXECUTION

3.1 FIELD QUALITY CONTROL

A. During diversion pumping, do not allow sewage to leak, dump, or spill into or onto areas outside of existing sanitary sewer systems.

B. In the event of an accidental spill or overflow, immediately stop discharge and take action to clean up and disinfect spill. Promptly notify the Project Manager so required reporting can be made to the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA).

3.2 CLEANING

A. When diversion-pumping operations are complete, drain sewage within piping into sanitary sewers prior to disassembly.

END OF SECTION

SECTION 01520

TEMPORARY FIELD OFFICE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Temporary field office building and associated parking area.

1.2 FACILITY DESCRIPTION

A. Temporary field office to be utilized by authorized representatives of the City to coordinate and monitor daily construction activities performed by the Contractor.

B. Field office shall be a non-smoking facility.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01770 Closeout Procedures.

PART II: PRODUCTS

2.1 FIELD OFFICE

A. General:

1. Locate office in vicinity of the Work at a location approved by the Project Manager or where indicated on the Drawings.

2. Furnish, Install and maintain field office for exclusive use of authorized representatives of the City. Provide sufficient room for Project meetings and Project Manager's office.

3. Provide office within ten days (10 D) of Date of Commencement of the Work.

4. Construct two (2) all-weather, hard surfaced parking spaces for exclusive use of authorized representatives of the City. Provide all-weather surfaced walk between parking spaces and field office.

B. Minimum Construction:

1. Structurally sound foundation and superstructure.

2. Weather tight with insulated roof, walls and seven foot (7 Ft) ceiling (minimum).

3. Stairs or walkway with handrail and covered entrance platform [minimum four feet by four feet (4 Ft x 4 Ft)] with mud scraper at door.

4. Resilient floor covering.

5. Screened windows with area equal to approximately ten percent (10%) of floor area sufficient for light, view of the site, and ventilation. Provide each window with operable sash and burglar bars.

6. Secure exterior doors with dead-bolt cylinder locks and burglar bars.

C. Minimum Services:

1. Exterior entrance light.

2. Interior lighting of seventy-five foot-candles (75 fc) minimum at desktop height.

3. Automatic heating to maintain sixty-five degrees Fahrenheit (65° F) in winter.

4. Automatic cooling to maintain seventy-five degrees Fahrenheit (75° F) in summer.

5. Electric power service.

6. Two (2) telephone service lines one (1) for voice, one (1) for data/fax, for exclusive use of authorized representatives of the City.

7. Sanitary facilities in field office with one (1) water closet, one (1) lavatory, and one (1) medicine cabinet for exclusive use of authorized representatives of the City.

D. Minimum Furnishings:

1. One (1) five (5) drawer desk.

2. Two (2) swivel desk chairs with casters.

3. One (1) plan table.

4. One (1) drawing plan rack.

5. One (1) four (4) drawer legal file cabinet complete with fifty (50) legal-size hanging folders and two (2) full-sized carriers.

6. One (1) marker board with cleaner and markers.

7. Two (2) waste baskets.

8. One (1) thirty inch by thirty-six (30 In x 36 In) tack board.

9. One (1) all-purpose fire extinguisher.

10. Six (6) protective helmets (hard hats) with ratchet adjustment for exclusive use of authorized representatives of the City.

11. Conference table and chairs to accommodate ten (10) persons.

12 Telephone instrument.

E. Provide adequate space for one (1) set of Contract Documents for ready reference.

PART III: EXECUTION

3.1 MAINTENANCE

A. Maintain all-weather surface driveway and parking areas, buildings, walkways, stairs and required furnishings and equipment for duration of the Contract.

B. Provide janitorial services for duration of the Contract consisting of twice weekly sweeping and mopping floors, trash removal, weekly restroom cleaning, and weekly dusting of furniture and equipment.

C. Provide soap, paper towels, toilet paper, cleansers and other necessary consumables.

D. Immediately repair damage, leaks or defective service.

3.2 PROJECT CLOSEOUT

A. Remove temporary field office and signs and restore site as specified in Section 01770 Closeout Procedures.

END OF SECTION

SECTION 01555

TRAFFIC CONTROL AND REGULATION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for signs, signals, control devices, traffic barriers, flares, lights and traffic signals; construction parking control, designated haul routes, and bridging of trenches and excavations.

B. Qualifications and requirements for use of flagmen.

1.2 MEASUREMENT AND PAYMENT

A. Unit Price Contracts:

1. Traffic control and regulation: Payment for traffic control and regulation is on a lump sum basis. Include preparation and submittal of traffic control plan if different than shown on the Drawings, and provision of traffic control devices, equipment, and personnel necessary to protect the Work and the public. Payment will be based on the Contractor's Schedule of Values for traffic control and regulation.

2. Flagmen: Payment for flagmen is on a lump sum basis. Partial payments will be based on the Contractor's Schedule of Values for flagmen.

3. New Portable Concrete Low Profile Traffic Barrier Provided: Payment is on a unit price basis for each linear foot of low profile traffic barrier provided, installed with hardware assemblies and connected together in accordance with the approved traffic control plan.

4. Portable Concrete Low Profile Traffic Barrier Installed: Payment is on a unit price basis for each linear foot of low profile traffic barrier delivered to the project location, installed with hardware assemblies and connected together in accordance with the approved traffic control plan.

5. Portable Concrete Low Profile Traffic Barrier Moved and Reset: Payment is on a unit price basis for each linear foot of low profile traffic barrier disassembled, moved on the project, reset

at the new locations and connected together. Include cost to repair roadway in the unit price.

6. Portable Concrete Low Profile Traffic Barrier Removed: Payment is on a unit price basis for each linear foot of low profile traffic barrier removed from the project, including hardware assemblies, and stockpiling at location listed in Section 01110 Summary of Work. Include cost to repair roadway in the unit price.

7. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price Contracts.

1. Include payment for work under this Section in the Total Stipulated Price.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01110 Summary of Work.

2. Section 01270 Measurement and Payment.

3. Section 01330 Submittal Procedures.

B. TCCP Texas Code of Criminal Procedure.

1. Article 2.12, Texas Code of Criminal Procedure.

C. TMUTCD Texas Manual on Uniform Traffic Control Devices.

D. TVCAS Texas Vernon's Civil Annotated Statutes.

1. Article 4413 (29bb), commonly referred to as Private Investigators and Private Security Agencies Act.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Traffic control plan:

1. If using traffic control plan contained in the Contract without modification, submit a letter confirming use of the plan.

2. If using a different traffic control plan, submit the plan for approval. The plan must conform to TMUTCD requirements and be sealed by a Professional Engineer licensed by the State of Texas.

C. Submit records verifying qualifications of Uniformed Peace Officers and Certified Flagmen proposed for use on the Work.

1.5 FLAGMEN

A. Use Uniformed Peace Officers and Certified Flagmen to control movement of vehicular and pedestrian traffic when construction operations encroach on public traffic lanes.

B. Uniformed Peace Officer: Individual employed full-time as a peace officer who receives separate compensation as a privately employed flagman. Private employment may be an employee-employer relationship or on an individual basis. Flagman may not be in the employ of another peace officer nor be a reserve peace officer.

1. Uniformed Peace Officers may be:

a. Sheriffs and their deputies;

b. Constables and deputy constables;

c. Marshals or police officers of an incorporated city, town or village; or

d. as otherwise provided by Article 2.12, Code of Criminal Procedure.

2. The Uniformed Peace Officer must be a full-time peace officer, must work a minimum average of thirty-two (32) paid hours per week, and must be paid a rate not less than the prevailing minimum hourly wage rate set by the federal Wage and Hour Act. The individual must be entitled to vacation, holidays, and insurance and retirement benefits.

C. Certified Flagman: Individual who receives compensation as a flagman and meets the following qualifications:

1. Formally trained and certified in traffic control procedures.

2. Shall speak English fluently. Ability to speak Spanish is desirable but not required.

3. Paid for flagman duty at an hourly rate not less than the wage rate set for Rough Carpenter under the City's Wage Scale for Engineering Construction.

D. Certified Flagmen must wear a distinctive uniform, bright-colored vest, and be equipped with appropriate flagging and communication devices while at the Work site. They must also have in their possession while on duty, a proof of training identification card issued by the appropriate training institute.

PART II: PRODUCTS

2.1 SIGNS, SIGNALS, AND DEVICES

A. Comply with TMUTCD requirements.

B. Traffic cones and drums, flares and lights: Conform to local jurisdictions' requirements.

2.2 PORTABLE LOW PROFILE CONCRETE BARRIERS

A. The low profile concrete barrier is a patented design. Information concerning this barrier may be obtained from Texas Transportation Institute, Texas A&M University System, College Station, Texas 77843-3135, (409) 845-1712.

PART III: EXECUTION

3.1 PUBLIC ROADS

A. Submit requests forms for lane closure and sidewalk closure to the City's Community Development Department at least three working days (3 wD) prior to need for blocking vehicular lanes or sidewalks. Do not block lanes or sidewalks without approved permits.

B. Follow laws and regulations of governing jurisdictions when using public roads. Pay for and obtain permits from jurisdiction before impeding traffic or closing lanes. Coordinate activities with the Project Manager.

C. Give the Project Manager one week (1 Wk) notice before implementing approved traffic control phases. Inform local businesses of impending traffic control activities.

D. Notify police department, fire department, local schools, churches,

and businesses in writing a minimum of five working days (5 wD) prior to beginning work.

E. Maintain ten foot (10 Ft) wide all-weather lanes adjacent to the Work for emergency vehicle use. Keep all-weather lanes free of construction equipment and debris.

F. Do not obstruct normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by the Project Manager.

G. Maintain local driveway access to residential and commercial properties adjacent to work areas at all times. Use all-weather materials approved by the Project Manager to maintain temporary driveway access to commercial and residential driveways.

H. Keep streets entering and leaving job site free of excavated material, debris, and foreign material resulting from construction operations in compliance with applicable ordinances.

I. Remove existing signage and striping that conflict with construction activities or that may cause driver confusion.

J. Provide safe access for pedestrians along major cross streets.

K. Alternate closures of cross streets so that two (2) adjacent cross streets are not closed simultaneously.

L. Do not close more than two (2) consecutive esplanade openings at a time without prior approval from the Project Manager.

3.2 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and the City's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.3 FLARES AND LIGHTS

A. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.4 HAUL ROUTES

A. Utilize haul routes designated by authorities or shown on the Drawings for construction traffic.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.5 TRAFFIC SIGNS AND SIGNALS

A. Construct necessary traffic control devices for temporary signals required to complete the Work including loop detectors, traffic signal conduits, traffic signal wiring and crosswalk signals.

B. Install and operate traffic control signals to direct and maintain orderly traffic flow in areas under the Contractor's control affected by the Contractor's operations. Post notices, signs and traffic controls before moving into next phase of traffic control.

C. Relocate traffic signs and signals as the Work progresses to maintain effective traffic control.

D. Unless otherwise approved by the Project Manager, provide driveway signs with name of business that can be accessed from each crossover. Use two (2) signs for each crossover.

E. Replace existing traffic control devices in the work area.

F. The Project Manager may direct the Contractor to make minor adjustments to traffic control signage to eliminate driver confusion and maintain orderly traffic flow during construction at no additional cost to the City.

3.6 BRIDGING TRENCHES AND EXCAVATIONS

A. When necessary, construct bridges over trenches and excavation to permit an unobstructed flow of traffic across construction areas and major drives. Use steel plates of sufficient thickness to support H-20 loading and install to operate with minimum noise.

B. Shore trench or excavation to support bridge and traffic.

C. Secure bridging against displacement with adjustable cleats, angles, bolts or other devices when:

1. bridging is placed over existing bus routes,

2. more than five percent (5%) of daily traffic is comprised of commercial or truck traffic,

3. more than two (2) separate plates are used for bridging, and

4. when bridge is to be used for more than five (5) consecutive days.

D. Extend steel plates used for bridging a minimum of one foot (1 Ft) beyond edges of trench or excavation. Use temporary paving materials such as premix to feather edges of plates to minimize wheel impact on secured bridging.

3.7 REMOVAL

A. Remove equipment and devices when no longer required.

B. Repair damage caused by installation.

C. Remove post settings to a depth of two feet (2 Ft).

3.8 TRAFFIC CONTROL, REGULATION AND DIRECTION

A. Use Flagmen to control, regulate and direct an even flow and movement of vehicular and pedestrian traffic, for periods of time as may be required to provide for public safety and convenience, where:

1. multi-lane vehicular traffic must be diverted into single lane vehicular traffic,

2. vehicular traffic must change lanes abruptly,

3. construction equipment must enter or cross vehicular traffic lanes and walks,

4. construction equipment may intermittently encroach on vehicular traffic lanes and unprotected walks and crosswalks,

5. traffic regulation is needed due to rerouting of vehicular traffic around the work site, and

6. where construction activities might affect public safety and convenience.

B. Use of Flagmen to assist in the regulation of traffic flow and movement does not relieve the Contractor of responsibility to take other means necessary to protect the Work and the public.

C. Flagmen shall use stop/slow signs to regulate traffic around construction areas. Flags shall not be allowed, unless flagmen are trained in the proper use and techniques.

3.9 INSTALLATION STANDARDS

A. Place temporary pavement for single lane closures, in accordance with TMUTCD.

B. Reinstall temporary and permanent pavement markings as approved by the Project Manager. When weather conditions do not allow application according to manufacturer's requirements, alternate markings may be considered. Submit proposed alternate to the Project Manager for approval prior to installation. No additional payment will be made for use of alternate markings.

3.10 MAINTENANCE OF EQUIPMENT AND MATERIAL

A. Submit name, address and telephone number of individual designated to be responsible for maintenance of traffic handling at construction site to the Project Manager. Individual must be accessible at all times to immediately correct deficiencies in equipment and materials used to handle traffic including missing, damaged, or obscured signs, drums, barricades, or pavement markings.

B. Inspect signs, barricades, drums, lamps and temporary pavement markings daily to verify that they are visible, in good working order, and conform with traffic handling plans as approved by the Project Manager. Immediately repair, clean, relocate, realign, or replace equipment or materials that are not in compliance.

C. Keep equipment and materials, signs and pavement markings, clean and free of dust, dirt, grime, oil, mud, or debris.

D. Obtain approval of the Project Manager to reuse damaged or vandalized signs, drums, and barricades.

END OF SECTION

SECTION 01560

TREE AND PLANT PROTECTION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Tree and plant protection and maintenance.

B. Planting new trees and relocating and replanting existing trees.

C. Maintenance of planted or replanted trees.

1.2 SUBMITTAL

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit name and experience of qualified Arborist, proposed for use on the Work, to the Project Manager.

1.3 PROJECT CONDITIONS

A. Preserve and protect existing trees and plants that are to remain; from damage to foliage, branches, trunk, or roots; that could result from construction operations.

B. Do not remove any Tree unless Parks and Recreation Department grants written permission for removal. Prevent following types of damage:

1. Compaction of root zone by foot, vehicular traffic, or material storage.

2. Trunk damage from equipment operations, material storage, or from nailing or bolting.

3. Trunk and branch damage caused by ropes or guy wires.

4. Root poisoning from spilled solvents, gasoline, paint, and other noxious materials.

5. Branch damage due to improper pruning or trimming.

6. Damage from lack of water due to:

a. Cutting or altering natural water migration patterns near root zones.

b. Failure to provide adequate watering.

7. Damage from alteration of soil pH factor caused by depositing lime, concrete, plaster, or other base materials near roots.

8. Cutting of roots larger than one and one-half inches (1-1/2 In) in diameter.

1.4 DAMAGE ASSESSMENT

A. When a Tree, other than those permitted for removal, are destroyed or badly damaged as result of construction operations, remove and replace with same size, species, and variety. Replace trees larger than eight inches (8 In) in diameter with an eight inch (8 In) diameter tree of same species and variety.

B. Contract Price shall be reduced by the amount determined by Parks and Recreation Department if the tree is not replaced.

1.5 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01330 Submittal Procedures.

2. Section 01565 Authorized Tree List

B. ISA International Society of Arboriculture.

PART II: PRODUCTS

2.1 MATERIALS

A. Asphalt Paint: Emulsified asphalt or other adhesive, elastic, antiseptic coating formulated for horticultural use on cut or injured plant tissue, free from kerosene and coal creosote.

B. Burlap: Suitable for use as tree wrapping.

C. Fertilizer: Liquid containing twenty percent (20%) nitrogen, ten percent (10%) phosphorus and five percent (5%) potash.

D. Obtain the Project Manager's approval of replacement trees.

PART III: EXECUTION

3.1 PROTECTION AND MAINTENANCE OF EXISTING TREES AND SHRUBS

A. Trees within the Project area, except for trees shown on the Drawings or directed by the Project Manager to be removed and relocated, are to remain in place. Protect from damage and maintain trees that are to remain.

B. Perform the following for trees or shrubs that are to remain:

1. Trim trees and shrubs under supervision of a professional tree surgeon or horticulturist.

   a. Prune trees according to International Society of Arboriculture specifications.

   b. Prune trees and shrubs requiring pruning for construction operations for balance and to maintain proper form and branching habit.

   c. Cut limbs at branch collar and remove stubs. Do not gouge outer layer of tree structure or trunk.

   d. Prior to construction, prune all trees to remain of new or recent growth to maintain basic branching form of trees. Base extent of pruning upon proximity of pavement to trunk and size of tree blockouts and requirements of construction adjacent to tree.

   e. Limit pruning of young branches to the maximum extent possible. Maintain older branches that provide basic form of tree. Prune in the presence of the Project Manager.

   f. Paint exposed, living tissue of cuts over three-quarters inch (3/4 In) in diameter with tree paint.

2. Use extreme care to prevent excessive damage to root systems.

   a. Cut tree roots in construction area smoothly with a trencher before excavating. Do not allow ripping of roots with backhoes or other equipment.

   b. Temporarily cover exposed roots with wet burlap to prevent roots from drying out.

c. Cover exposed roots with soil as soon as possible.

3. Prevent damage or compaction of root zone (area below drip line) by construction activities.

   a. Do not allow equipment to scar trunks or limbs.

   b. Do not store construction materials, vehicles, or excavated material under drip line of trees.

   c. Do not pour liquid materials under drip line.

4. Water and fertilize remaining trees and shrubs to maintain their health during construction period.

   a. Water landscaping during construction operations at least once every seven days (7 D) in cold months and once every four days (4 D) in hotter months.

   b. Saturate soils to at least six inches (6 In) to eight inches (8 In) beneath surface.

5. Water areas currently being served by private sprinkler systems while systems are temporarily taken out of service to maintain health of existing landscapes.

6. With the Project Manager's permission, shrubs to remain may be temporarily transplanted and returned to original positions under supervision of professional horticulturist.

3.2 PROTECTION

A. Protection of Trees or Shrubs in Open Area:

1. Install steel drive-in fence posts in protective circle, approximately eight feet (8 Ft) on center, not closer than four feet (4 Ft) to trunk of trees or stems of shrubs.

2. Insert steel drive-in fence posts a minimum of three feet (3 Ft) into ground, leaving a minimum of five feet (5 Ft) above ground.

3. Mount fluorescent orange construction fence on fence posts.

4. For trees or shrubs in paved areas, use movable posts consisting of two one-half inch (2-1/2 In) minimum diameter concrete-filled steel pipe mounted in rubber automobile tires

filled with concrete.

B. Provide timber wrap protection for trees in close proximity to equipment when work is required within construction fencing.

1. Wrap trunk with a layer of burlap.

2. Install vertical five foot (5 Ft) to six foot (6 Ft) long, two inch by four inch (2 In x 4 In) or two inch by five inch (2 In x 5 In) studs, spaced three inches (3 In) to five inches (5 In) apart, around circumference of tree trunk.

3. Tie burlap in place with twelve (12) gauge to nine (9) gauge steel wire.

3.4 RELOCATING AND PLANTING NEW TREES

A. Employ a qualified Arborist, acceptable to the Project Manager, to plant and to move and relocate trees. Arborist must be normally engaged in the field and have a minimum of five years (5 Yrs) experience.

B. Verify that the trees to be planted are acceptable to the City and listed in Section 01565 Authorized Tree List.

3.4 MAINTENANCE OF NEWLY PLANTED TREES AND REPLANTED TREES.

A. Provide proof of capability to water trees during dry periods.

B. Maintain newly planted trees, in healthy condition until end of one-year warranty bond.

1. Straighten leaning trees.

2. Replace dead trees or trees that, in the opinion of the Project Manager, have become unhealthy, unsightly or have lost their natural shape as result of additional growth, improper pruning, maintenance or weather conditions, within four weeks (4 Wks) of notice from the Project Manager.

3. When a tree must be replaced, a new warranty period shall commence on date of tree replacement, and the Project Manager s approval. Minimum warranty period shall be one year (1 Yr).

4. Dispose of rejected trees.

END OF SECTION

SECTION 01565

AUTHORIZED TREE LIST

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide quality and sustainable trees in the City.

1.2 MEASUREMENT AND PAYMENT

A. Unless otherwise stated, there shall be no separate payment for installation of trees, shrubs or bushes.

1.3 REFERENCES

A. CFDCM City of Friendswood Design Criteria Manual.

1. Appendix D Qualified Tree List

B. CFCO City of Friendswood Code of Ordinances.

1. Appendix C Zoning.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 02920 Tree Planting.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certification from supplier that each type of tree conforms to these specification requirements.

C. The Design Criteria Manual shall be the final authority of the approved tree list. Substitutions may be submitted as specified in Section 01330 Submittal Procedures, only after approved by either a Landscape Engineer or Urban Forester and as approved by the Director of Community Development.

PART II: PRODUCTS

2.1 GENERAL

A. Trees are divided into four (4) classes. Class I and Class II trees are considered the most valuable in enhancing the environment and are most likely to prosper in the City and surrounding area. Therefore, only Class I and Class II tress shall be approved as new plantings for:

1. City Parks and property, and
2. parking lots, and
3. streets and other public rights-of-way.

There shall be no exceptions unless approved by the Director of Community Development on the advice of an Urban Forester.

B. Species that are identified as shade trees shall reach a height and size that will conflict with overhead powerlines or permanent structures; or the canopy will exceed the limits of a confined space.

C. Species that are identified as small trees will not provide the protection or have the aesthetic impact as the large shade tree, yet they are suitable for planting beneath powerlines and are good alternatives for areas of limited space.

2.2 TREE CLASSIFICATIONS

A. Class I trees are mostly native to the area, and do very well in Friendswood and surrounding area. They have few disease or pest problems and are easy to find in local nurseries with exceptions (those being the larger size trees).

B. Class II trees are mostly native, yet still do well in Friendswood and the surrounding area. They have little pest or disease problems, but are harder to find in the nurseries. They are more varied in size and many are more suitable for wildlife. These trees tend to either have larger and messier fruit and/or are thornier than Class I trees. Some of these trees are also prone to some decay at maturity and might do as well in urbanized areas.

C. Class III trees are more introduced than native species. These trees may or may not do as well in Friendswood and surrounding area. They require more maintenance and care. Natives might be harder to find in a nursery while the introduced species may be more readily available. In some cases this Class of trees are more prone to decay, disease and

pest problems.

D. Class IV trees are exclusively introduced to the Friendswood and the surrounding area. If they do grow well, they have the potential to become an invasive species and cause problems for local ecosystems. These trees are more prone to decay, disease and pest problems.

1. THESE TREES ARE NOT RECOMMENDED FOR PLANTINGS.

2.3 CHARACTERISTICS

A. Location Designations:

1. N NATIVE: Trees that are common to the local region, that grow naturally.

2. I INTRODUCED: Trees that are not common to the are and thrive in other regions or areas.

B. Site:

1. 1 Xerophytic requires very little or little water.

2. 2 Mesic requires moderate water with good drainage.

3. 3 Aquatic tolerates poor drainage after established for three years (3 Yrs).

C. Light:

1. Very intolerant to shade.

2. Intolerant to shade.

3. Moderately intolerant to shade.

D. Size:

1. 1 Sixty feet (60 Ft) and greater in ultimate height (large shade tree).

2. 2 Thirty feet (30 Ft) to Sixty feet (60 Ft) in ultimate height (Medium tree).

3. 3 Thirty feet (30 Ft) and less in ultimate height (small tree).

E. Foliage:

1. D DECIDUOUS (sheds leaves annually). If place on south and west walls, will reduce indoor temperatures in summer by shading the roof and the walls. In winter, these trees allow sunlight through to help heat the house.

2. E EVERGREEN (having green leaves or needles throughout the year). Can create a windbreak if placed on the Northwest side of the building.

3. SE SEMI-EVERGREEN.

2.4 TREE CODING

A. Populating the different Class Tables found in PART IV of this Section, and using the above categories for evaluation of trees and allows the understanding of the tree's parameters. The Live Oak code of 1/N/2/1/1/SE, indicates that it is a Class I Tree (**1**/N/2/1/1/SE) it is native to this area (1/**N**/2/1/1/SE), it requires moderate water with good drainage (1/N/**2**/1/1/SE), it demands full sun (1/N/2/**1**/1/SE), will ultimately grow sixty (60) foot or taller (1/N/2/1/**1**/SE) and is a Semi-Evergreen type of tree (1/N/2/1/1/**SE**). As a shade tree the Live Oak will provide protection and have aesthetic impact but the tree is not suitable for planting beneath powerlines, within confined spaces, in streets or other public rights-of-way.

PART III: EXECUTION NOT USED.

PART IV: TABLES

4.1 CLASS I TREE LIST

Common Name	Botanical Name	Class	N/I	Site	Light	Size	E/D
Bald Cypress	Taxodium distichum	1	N	2,3	2	1	D
Bur Oak	Quercus macrocarpa	1	N	2	1	1	D
Cedar Elm	Ulmus crassifolia	1	N	2	1	2	D
Drummond Red Maple	Acer rubrum var. drummondii	1	N	2	1	2	D
Eastern Redbud	Cercis Canadensis	1	N	2	2	2	D
Live Oak	Quercus virginiana	1	N	2	1	1	SE
Overcup Oak	Quercus lyrata	1	N	2,3	1	1	D
Pecan	Carya illinoensis	1	N	2	1	1	D
Possumhaw Holly	Ilex decidua	1	N	2	1,2	3	D
Shumard Red Oak	Quearcus shumardii	1	N	2	1	1	D
Southern Magnolia	Magnolia grandiflora	1	N	2,3	1	1	E
Swamp Chestnut Oak	Quercus michhauxii	1	N	2,3	1	1	D
Sweet-Bay Magnolia	Magnolia virginiana	1	N	2	2	2	E
Wax Myrtle	Myrica cerifera	1	N	2,3	1	3	E

4.2 CLASS II TREE LIST

Common Name	Botanical Name	Class	N/I	Site	Light	Size	E/D
American Elm	Ulmus Americana	2	N	2	1	1	D
American Sycamore	Plantus occidentalis	2	N	2	1	1	D
Anacua/Sandpaper Tree	Ehretia anacua	2	N	2	1	2	E
Arrow-wood Viburnum	Vibirnum dentatum	2	N	2	2	3	D
Black Hickory	Carya texana	2	N	2	1,2	2	D
Black Walnut	Juglans nigra	2	N	2	1,2	1	D
Blackgum	Nyssa sylvatica	2	N	2,3	1,2	3	D
Callery Pear/Bradford	Pyrus calleryana	2	I	2	1	3	D
Carolina buckthorn	Rhamnus caroliniana	2	N	2	1,2	3	D
Chalk Maple	Acer leucoderme	2	N	2	2	2	D
Cherry Laurel	Prunus caroliniana	2	N	2	2	2	E
Chinese Elm	Ulmus parvifolia	2	I	2	1	2	D
Chinquapin Oak	Quercus muhlenbergii	2	N	2	1	1	D
Common Crapemyrtle	Lagerstroemia infica	2	I	2	1	3	D
Common Fig	Ficus carica	2	I	2	1	3	D
Common Persimmon	Diospyros virginiana	2	N	2	1	2	D
Eastern Red Cedar	Juniperus virginiana	2	N	2	1,2	2	E
Eve's Necklace	Sophora affinis	2	N	1	1	3	D
Green Ash	Fraxinus pennsylvanica	2	N	2,3	1,2	1	D
Huisache	Acacia farnesiana	2	N	1	1	3	D
Loblolly Pine	Pinus taeda	2	N	2	1	1	E
Mexican Plum	Prunus Mexicana	2	N	1	1	3	D
Nuttail Oak	Quercus nuttallii	2	N	2,3	1	1	D
Ornamental Holly	Ilex spp.	2	I	2	1,2	3	E
Paloverde	Parkinsonnia aculeate	2	N	1	1	2	D
Parsley Hawthorn	Crataegus marshallii	2	N	2	2	3	D
Post Oak	Quercus stellata	2	N	2	2	1	D
Red Bay	Persea borbonia	2	N	2	2	2	E
River Birch	Betula nigra	2	N	2,3	2	2	D
Rough-leaf Dogwood	Cornus drummondii	2	N	1,2	3	3	D
Rusty Blackhaw Viburnum	Viburnum rufidulum	2	N	2	2	3	D
Sassafras	Sassafras albidium	2	N	2	2	2	D
Scarlet (Red) Buckeye	Aesculus pavia	2	N	2	2	3	D
Shagbark Hickory	Carya ovata	2	N	2	1	1	D
Slash Pine	Pinus elloittii	2	I	2	1	1	E
Snowbell	Styrax Americana	2	N	2	1,2	3	D
Southern Red Oak	Quercus falcate var. pagoda	2	N	2	2	1	D
Sweetgum	Liquidambar styraciflua	2	N	2	1	1	D
Texas Mountain-Laurel	Sophora secundiflora	2	N	1	1	3	E
Texas Persimmon	Diospyros virginiana (male)	2	N	1	1	3	D
Texas Pistache	Pistacia texana	2	N	1	1	3	D
Texas Redbud	Cercis Canadensis texensis	2	N	1,2	2	3	D
Water Hickory	Carya aquatica	2	N	2,3	1	2	D
Water Oak	Quercus nigra	2	N	2,3	1	1	D
Western Soapberry	Sapindus Drummondii	2	N	2	1	2	D
White Ash	Fraxinus Americana	2	N	2	1	1	D
White Oak	Quercus alba	2	N	2	1	1	D
Willow Oak	Quercus phellos	2	N	2,3	1	1	D
Winged Elm	Ulmus alata	2	N	2	1	2	D
Woolybucket Bumelia	Bumelia lanuginose	2	N	2	2	2	D
Wright Acacia	Acacua wrightii	2	N	1	1	3	D
Yaupon Holly	Ilex vomitoria	2	N	2	1,2	3	E

4.3 CLASS III TREE LIST

Common Name	Botanical Name	Class	N/I	Site	Light	Size	E/D
American Elderberry	Sambucus Canadensis	3	N	2	2	3	D
American Holly	Ilex opaca	3	N	2	2	2	E
American Hornbean	Carpinus caroliniana	3	N	2	2	2	D
Black Locust	Robinia pseudocacia	3	N	2,3	1	2	D
Black Willow	Salix nigra	3	N	3	1	2	D
Box-Elder Maple	Acer negundo	3	N	2	2	2	D
Camphor Tree	Cinnamomum camphora	3	I	2	1	2	E
Catalpa	Catalpa bignonioides	3	N	2	1	2	D
Common Pear	Pyrus communis	3	N	2	1	2	D
Eastern Cottonwood	Populus deltoides (male)	3	N	2	1	1	D
Flowering Crabapple	Malus spp.	3	I	2	1	3	D
Hercules-Club Prickly-Ash	Zanthoxylum clava-herculis	3	N	1	1	3	D
Honey-Locust	Gleditsia triacanthos	3	N	2,3	1	2	D
Japanese Yew	Podocarpus macrophyllus	3	I	2	1	2	E
Japanese Maple	Acer palmatum	3	I	2	2	2	D
Loquat	Eriobotrya japonica	3	I	2	2	3	E
Mesquite	Prosopis glandulosa	3	N	1	1	2	D
Mexican Buckeye	Ungnadia speciosa	3	N	1	1	3	D
Red Mulberry	Morus rubra	3	N	2	1	2	D
Sugar Hackberry	Celtis laevigata	3	N	2	1,2	2	D
Vitex	Vitex agnus-castus	3	I	1	1	3	D
Water Tupelo	Nysa aqquatica	3	N	3	2	1	D
Weeping Willow	Salix babylonica	3	I	3	1	2	D

4.4 CLASS IV TREE LIST

Common Name	Botanical Name	Class	N/I	Site	Light	Size	E/D
Arborvitae	Thuja spp.	4	I	2	1,2	2	E
Arizona Ash	Fraxinus velutina	4	I	1	1	2	D
Berlandier Ash	Fraxinus berlandieriana	4	I	1	1	2	D
Chinaberry	Melia azedarach	4	I	2	1	2	SE
Chinese Pistache	Pistacia chinensis	4	I	2	1	2	D
Chinese Tallow	Sapium sebiferum	4	I	2	1,2	3	D
Eucalyptus	Eucalyptus spp.	4	I	2,3	1	3	E
Golden-Raintree	Koelreuteria paniculata	4	I	2	1	2	D
Japanese Black Pine	Pinus thunbergi	4	I	2	1	2	E
Mimosa (Silktree)	Albizia julibrissin	4	I	1,2	1,2	2	D
Mulberry	Morus alba	4	I	2	1	2	D
Siberian Elm	Ulmus pumila	4	I	1,2	1,2	1	D
Silver Maple	Acer saccharinum	4	I	1,2	1	3	D
Tulip-Tree	Liriodendron tulipifera	4	I	2	1	1	D

END OF SECTION

SECTION 01570

STORM WATER POLLUTION CONTROL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Implementation of Storm Water Pollution Prevention Plans (SW3P) described in Section 01410 -TPDES Requirement.

B. Installation and maintenance of storm-water pollution prevention structures: diversion dikes, interceptor dikes, diversion swales, interceptor swales, down spout extenders, pipe slope drains, paved flumes and level spreaders. Structures are used during construction and prior to final development of the site.

C. Filter Fabric Fences:

1. Type 1: Temporary filter fabric fences for erosion and sediment control in non-channelized flow areas.

2. Type 2: Temporary reinforced filter fabric fences for erosion and sediment control in channelized flow areas.

D. Straw Bale Fence.

1.2 MEASUREMENTAND PAYMENT

A. UNIT PRICES.

1. Payment for filter fabric fence is on a linear foot basis measured between limits of beginning and ending of stakes.

2. Payment for reinforced filter fabric fence is on a linear foot basis measured between limits of beginning and ending of stakes.

3. Payment for drop inlet baskets is on a unit price basis for each drop inlet basket.

4. Payment for storm inlet sediment traps is on a unit price basis for each storm inlet sediment trap.

5. Payment for storm-water-pollution-prevention structures is on a lump sum basis for the project. Earthen structures with outlet

and piping includes diversion dikes, interceptor dikes, diversion swales, interceptor swales, and excavated earth-outlet sediment trap, embankment earth-outlet sediment trap, down spout extenders, pipe slope drains, paved flumes, stone outlet sediment trap, and level spreaders.

6. Payment for straw bale barrier, if included in Document 00300 Unit Price Form, is on a linear foot of accepted bale barriers, if not include in cost of storm water pollution prevention structures.

7. Payment for brush berm, if included in Document 00300 Unit Price Form, is on a linear foot of accepted brush berm, if not include in cost of storm water pollution prevention structures.

8. Payment for sandbag barrier, if included in Document 00300 Unit Price Form, is on a linear foot basis measured between limits of beginning and ending of sandbags, if not include in cost of storm water pollution prevention structures.

9. Payment for sediment basin with pipe outlet or stone outlet, if included in Document 00300 Unit Price Form, is on a square yard basis, if not include in cost of storm water pollution prevention structures.

10. Payment for inlet protection barriers, if included in Document 00300 Unit Price Form, is on a linear foot basis measured along outside face of inlet protection barrier, if not include in cost of storm water pollution prevention structures.

11. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum) Contract. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCE STANDARDS

A. ASTM American Society for Testing and Materials.

1. A36 Standard Specification for Carbon Structural Steel.

2. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

3. D3786 – Standard Test Method for Hydraulic Bursting Strength for Knitted Goods and Nonwoven Fabrics.

4. D4355 – Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

5. D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

6. D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

7. D4833 – Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

8. D6382 – Standard Practice for Dynamic Mechanical Analysis and Thermogravimetry of Roofing and Waterproofing Membrane Material.

B. City of Friendswood Storm Water Management Plan manual.

C. City of Friendswood Technical Specifications.

1. Document 00300 – Unit Price Form.

2. Section 01270 – Measurement and Payment.

3. Section 01330 – Submittal Procedures.

4. Section 01410 – TPDES Requirements.

5. Section 01505 – Temporary Facilities and Controls.

6. Section 01560 – Tree and Plant Protection.

7. Section 01575 – Stabilized Construction Exit.

8. Section 01580 – Waste Material Disposal.

9. Section 02100 – Clearing and Grubbing.

10. Section 02125 – Excavation and Backfill for Utilities.

11. Section 02135 – Excavation for Roadway.

12. Section 02140 – Utility Backfill Materials.

13. Section 02210 Corrugated Metal Pipe (CMP).

14. Section 02220 High Density Polyethylene Pipe (HDPE).

15. Section 02235 Polyvinyl Chloride Pipe (PVC).

16. Section 03300 Structural Concrete.

1.4 SYSTEM DESCRIPTIONS

A. Filter Fabric Fence Type 1 and Type 2: Install to allow surface or channel runoff percolation through fabric in sheet-flow manner and to retain and accumulate sediment. Maintain Filter Fabric Fences to remain in proper position and configuration at all times.

B. Straw Bale Fence: Install to allow surface runoff percolation through straw in sheet-flow manner and to retain and accumulate sediment. Maintain Straw Bale Fence to remain in proper position and configuration at all times.

C. Interceptor Dikes and Swales: Construct to direct surface or channel runoff around the project area or runoff from the project area into sediment traps.

D. Drop Inlet Baskets: Install to allow runoff percolation through the basket and to retain and accumulate sediment. Clean accumulation of sediment to prevent clogging and backups.

E. Sediment traps: Construct to pool surface runoff from construction area to allow sediment to settle onto the bottom of trap.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 -Submittal Procedures.

B. Submit manufacturer's literature for product specifications and installation instructions.

C. Submit manufacturers catalog sheets and other product data on geotextile or filter fabrics, outlet pipe, perforated riser and connectors.

D. Submit proposed methods, equipment, materials, and sequence of operations for storm-water pollution prevention structures.

E. Submit shop drawings for Drop Inlet Baskets.

PART II: PRODUCTS

2.1 CONCRETE

A. Concrete: Class A in accordance with Section 03300 Concrete for Utility Construction or as shown on the Drawings.

2.2 AGREGATE MATERIALS

A. Use poorly graded cobbles with diameter greater than three inches (3 In) and less than five inches (5 In).

B. Provide gravel lining in accordance with Section 2140 Utility Backfill Materials or as shown on the Drawings.

C. Provide clean cobbles and gravel consisting of crushed concrete or stone. Use clean, hard crushed concrete or stone free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic matter.

D. Sediment Pump Pit Aggregate: Use nominal two inch (2 In) diameter river gravel.

2.3 PIPE

A. Polyethylene culvert pipe or PVC sewer pipe in accordance with Section 02220 High Density Polyethylene (HDPE) Solid and Profile Wall Pipe and Section 02235 Polyvinyl Chloride Pipe (PVC) or as shown on the Drawings.

B. Inlet Pipes: Galvanized steel pipe in accordance with Section 02210 Corrugated Metal Pipe (CMP) or as shown on the Drawings.

C. Standpipe for Sediment Pump Pits: Galvanized round culvert pipe or round PVC pipe, a minimum of twelve inch (12 In) and a maximum of twenty-four inch (24 In) diameter, perforate at six inch (6 In) to twelve inch (12 In) centers around circumference.

2.4 GEOTEXTILE FILTER FABRIC

A. Woven or nonwoven geotextile filter fabric made of either polypropylene, polyethylene, ethylene, or polyamide material, in continuous rolls of longest practical length.

B. Grab Strength: one hundred pounds per square inch (100 psi) in any principal direction (ASTM D4632), Mullen burst strength > two hundred pounds per square inch (200 psi) (ASTM D3786), and equivalent

opening size between fifty millimeters (50 mm) and one hundred forty millimeters (140 mm).

C. Furnish ultraviolet inhibitors and stabilizers for a minimum six months (6 Mos) of expected usable construction life at temperature range of zero degrees Fahrenheit (0° F) to one hundred twenty degrees Fahrenheit (120° F).

D. Mirafi, Inc., Synthetic Industries, or equivalent.

2.5 FENCING

A. Wire Fencing: Woven galvanized steel wire, fourteen (14) gauge by six inch (6 In) square mesh spacing, a minimum twenty-four inch (24 In) roll or sheet width of longest practical length.

B. Fence Stakes: Nominal two inch by two inch (2 In x 2 In) moisture-resistant treated wood or steel posts [min. of one and one-quarter pounds per linear foot (1.25 Lbs/Lf) and Brinell Hardness greater than one hundred forty (140)] with safety caps on top; length as required for a minimum eight inch (8 In) bury and full height of filter fabric.

2.6 SANDBAGS

A. Provide woven material made of polypropylene, polyethylene, or polyamide material.

1. A minimum unit weight of four ounces per square yard (4 Oz/Sy).

2. A minimum grab strength of one hundred pounds per square inch (100 psi) in any principal direction (ASTM D4632).

3. Mullen burst strength exceeding three hundred pounds per square inch (300 psi) (ASTM D3786).

4. Ultraviolet stability exceeding seventy percent (70%).

5. Size:

a. Length: Eighteen inches (18 In) to twenty-four inches (24 In).

b. Width: Twelve inches (12 In) to eighteen inches (18 In).

c. Thickness: Six inches (6 In) to eight inches (8 In).

d. Weight: Fifty pounds (50 Lbs) to one hundred twenty-five pounds (125 Lbs).

2.7 DROP INLET BASKET

A. Provide steel frame members in accordance with ASTM A36.

B. Construct top frame of basket with two (2) short sides of two inch by two inch (2 In x 2 In) and single long side of one inch by one inch (1 In x 1 In), one-eighth inch (1/8 In) angle iron. Construct basket hangers of two inch by one-quarter inch (2 In x 1/4 In) iron bars. Construct bottom frame of one inch by one-quarter inch (1 In x 1/4 In) iron bar or one-quarter inch (1/4 In) plate with center three inches (3 In) removed. Use a minimum one-quarter inch (1/4 In) diameter iron rods or equivalent for sides of inlet basket. Weld a minimum of fourteen (14) rods in place between top frame/basket hanger and bottom frame. Exact dimensions for top frame and insert basket shall be determined based on dimensions of type of inlet being protected.

2.8 STRAW BALE

A. Straw: Standard-baled agricultural hay bound by wire, nylon, or polypropylene rope. Do not use jute or cotton binding.

B. Straw Bale Stakes (applicable where bales are on soil): No. 3 (3/8 inch diameter) reinforcing bars, deformed or smooth at Contractor's option, length as required for a minimum eighteen inch (18 In) bury and full height bales.

PART III: EXECUTION

3.1 PREPARATION, INSTALLATION AND MAINTAINANCE

A. Provide erosion and sediment control structures at locations shown on the Drawings.

B. Do not clear, grub or rough cut until erosion and sediment control systems are in place unless approved by the Project Manger to allow installation of erosion and sediment control systems, soil testing and surveying.

C. Maintain existing erosion and sediment control systems located within the project site until acceptance of the Project or until directed by the Project Manger to remove and discard existing system.

D. Regularly inspect and repair or replace damaged components of

erosion and sediment control structures. Unless otherwise directed, maintain erosion and sediment control structure until the project area stabilization is accepted. Redress and replace granular fill at outlets as needed to replenish depleted granular fill. Remove erosion and sediment control structures promptly when directed by the Project Manger. Dispose of materials in accordance with Section 01580 Waste Material Disposal.

E. Remove and dispose sediment deposits at the designated spoil site for the Project. If a project spoil site is not designated on the Drawings, dispose of sediment off site at approved location in accordance with Section 01580 Waste Material Disposal.

F. Unless otherwise shown on the Drawings, compact embankments, excavations, and trenches in accordance with Section 02135 Excavation for Roadway or Section 02125 Excavation and Backfill for Utilities.

G. Prohibit equipment and vehicles from maneuvering on areas outside of dedicated right of way and easements for construction. Immediately repair damage caused by construction traffic to erosion and sediment control structures.

H. Protect existing trees and plants in accordance with Section 1560 Tree and Plant Protection.

3.2 SEDIMENT TRAPS

A. Install sediment traps so that surface runoff shall percolate through system in sheet flow fashion and allow retention and accumulation of sediment.

B. Inspect sediment traps after each rainfall, daily during periods of prolonged rainfall, and at a minimum once each week. Repair or replace damaged sections immediately.

C. Use fill material for embankment in accordance with Section 02140 Utility Backfill Materials.

D. Excavation length and height shall be as specified on the Drawings. Use side slopes of two to one (2:1) or flatter.

E. Stone outlet sediment traps:

1. Maintain a minimum of six inches (6 In) between top of core material and top of stone outlet, a minimum of four inches (4 In) between bottom of core material and existing ground and a

minimum of one foot (1 Ft) between top of stone outlet and top of embankment.

2. Embed cobbles a minimum of four inches (4 In) into existing ground for stone outlet. Core shall be a minimum of one foot (1 Ft) in height and in width and wrapped in triple layer of geotextile filter fabric.

F. Sediment Basin with Pipe Outlet Construction Methods: Install outlet pipe and riser as shown on the Drawings.

G. Remove sediment deposits when design basin volume is reduced by one-third (1/3) or sediment level is one foot (1 Ft) below principal spillway crest, whichever is less.

3.3 FILTER FABRIC FENCE CONSTRUCTION METHODS.

A. Fence Type 1:

1. Install stakes three feet (3 Ft) on center maximum and firmly embed a minimum eight inches (8 In) in soil. If filter fabric is factory preassembled with support netting, then maximum support spacing is eight feet (8 Ft). Install wood stakes at a slight angle toward the source of anticipated runoff.

2. Trench in the toe of the fence lines so the downward face of the trenches is flat and perpendicular to direction of flow. V-trench configuration as shown on the Drawings may also be used.

3. Lay fabric along edges of trenches in longest practical continuous runs to minimize joints. Make joints only at a support post. Splice with a minimum six inch (6 In) overlap and seal securely.

4. Staple filter fabric to stakes at maximum three inches (3 In) on center. Extend fabric a minimum eighteen inches (18 In) and a maximum thirty-six inches (36 In) above natural ground.

5. Backfill and compact trench.

B. Fence Type 2:

1. Layout fence same as for Type 1.

2. Install stakes at six feet (6 Ft) on center maximum and at each joint in wire fence, firmly embedded one foot (1 Ft) minimum, and inclined it as for Type 1.

3. Tie wire fence to stakes with wire at six inches (6 In) on center maximum. Overlap joints a minimum one (1) bay of mesh.

4. install trench same as for Type 1.

5. Fasten filter fabric wire fence with tie wires at three inches (3 In) on center maximum.

6. Layout fabric same as for Type 1. Fasten to wire fence with wire ties at three inches (3 In) on center maximum and, if applicable, to stakes above top of wire fence it as for Type 1.

7. Backfill and compact trench.

C. Attach filter fabric to wooden fence stakes spaced a maximum of six feet (6 Ft) apart or steel fence stakes spaced a maximum of eight feet (8 Ft) apart and embedded a minimum of twelve inches (12 In). Install stakes at a slight angle toward source of anticipated runoff.

D. Trench in toe of filter fabric fence with spade or mechanical trencher so that downward face of trench is flat and perpendicular to direction of flow. A V-trench configuration may also be used. Lay filter fabric along edges of trench. Backfill and compact trench upon completion of Construction.

E. Filter fabric fence shall have a minimum height of eighteen inches (18 In) and a maximum height of thirty-six inches (36 In) above natural ground.

F. Cut length of fence to minimize use of joints. When joints are necessary, splice fabric together only at support post with a minimum six inch (6 In) overlap and seal securely.

G. Triangular Filter Fabric Fence Construction Methods:

1. Attach filter fabric to wire fencing, eighteen inches (18 In) on each side. Provide a fabric cover and skirt with continuous wrapping of fabric. Skirt should form continuous extension of fabric on upstream side of fence.

2. Secure triangular fabric filter fence in place using one (1) of the following methods:

a. Toe-in skirt six inches (6 In) with mechanically compacted material;

b. Weight down skirt with continuous layer of three inch (3 In) to five inch (5 In) graded rock; or

c. Trench-in entire structure four inches (4 In).

3. Anchor triangular fabric filter fence structure and skirt securely in place using six inch (6 In) wire staples on two foot (2 Ft) centers on both edges and on skirt, or staked using eighteen inch (18 In) by three-eighths inch (3/8 In) diameter re-bar with tee ends.

4. Lap fabric filter material by six inches (6 In) to cover segment joints. Fasten joints with galvanized shoat rings.

H. Reinforced Filter Fabric Barrier Construction Methods

1. Attach woven wire fence to fence stakes.

2. Securely fasten filter fabric material to wire fence with tie wires.

3. When used in swales, ditches or diversions, elevation of barrier at top of filter fabric at flow line location in channel shall be lower than bottom elevation of filter fabric at ends of barrier or top of bank, whichever is less, in order to keep storm water discharge in channel from overtopping bank.

4. Remove sediment deposits when silt reaches depth one-third (1/3) height of barrier or six inches (6 In), whichever is less.

3.4 DIKE AND SWALE

A. Unless otherwise indicated, maintain a minimum dike height of eighteen inches (18 In), measured from cleared ground at up slope toe to top of dike. Maintain side slopes of two to one (2:1) or flatter.

B. Dike and Swale Stabilization: When shown on the Drawings, place gravel lining three inches (3 In) thick and compacted into the soil or six inches (6 In) thick if truck crossing is expected. Extend gravel lining across bottom and up both sides of swale a minimum height of eight inches (8 In) vertically, above bottom. Gravel lining on dike side shall extend up the up slope side of dike a minimum height of eight inches (8 In), measured vertically from interface of existing or graded ground and up slope toe of dike, as shown on the Drawings.

C. Divert flow from dikes and swales to sediment basins, stabilized outlets, or sediment trapping devices of types and at locations shown on the Drawings. Grade dikes and swales as shown on the Drawings, or, if

not specified, provide positive drainage with a maximum grade of one percent (1%) to outlet or basin.

D. Clear in accordance with Section 02100 Clearing and Grubbing. Compact embankments in accordance with Section 02135 Excavation for Roadway.

E. Carry out excavation for swale construction so that erosion and water pollution is minimal. A minimum depth shall be one foot (1 Ft) and bottom width shall be four feet (4 Ft), with level swale bottom. Excavation slopes shall be two to one (2:1) or flatter. Clear, grub and strip excavation area of vegetation and root material.

3.5 DOWN SPOUT EXTENDER

A. Down spout extender shall have slope of approximately one percent (1%). Use pipe diameter of four inches (4 In) or as shown on the Drawings. Place pipe in accordance with Section 02125 Excavation and Backfill for Utilities.

3.6 PIPE SLOPE DRAIN

A. Compact soil around and under drain entrance section to top of embankment in lifts appropriately sized for method of compaction utilized.

B. Inlet pipe shall have slope of one percent (1%) or greater. Use pipe diameter as shown on the Drawings.

C. Top of embankment over inlet pipe and embankments directing water to pipe shall be at least one foot (1 Ft) higher at all points than top of inlet pipe.

D. Pipe shall be secured with hold-down grommets spaced ten feet (10 Ft) on centers.

E. Place riprap apron with a depth equal to pipe diameter with two to one (2:1) side slopes.

3.7 PAVED FLUME

A. Compact soil around and under the entrance section to top of the embankment in lifts appropriately sized for method of compaction utilized.

B. Construct subgrade to required elevations. Remove and replace soft sections and unsuitable material. Compact subgrade thoroughly and

shape to a smooth, uniform surface.

C. Construct permanent paved flumes in accordance with the Drawings.

D. Remove sediment from riprap apron when sediment has accumulated to depth of one foot (1 Ft).

3.8 LEVEL SPREADER

A. Construct level spreader on undisturbed soil and not on fill. Ensure that spreader lip is level for uniform spreading of storm runoff.

B. Maintain at required depth, grade, and cross section as specified on the Drawings. Remove sediment deposits as well as projections or other irregularities which shall impede normal flow.

3.9 INLET PROTECTION BARRIER

A. Place sandbags and filter fabric fences at locations shown on the SW3P.

3.10 DROP INLET BASKET CONSTRUCTION METHODS

A. Fit inlet insert basket into inlet without gaps around insert at locations shown on the SW3P.

B. Support for inlet insert basket shall consist of fabricated metal as shown on the Drawings.

C. Push down and form filter fabric to shape of basket. Use sheet of fabric large enough to be supported by basket frame when holding sediment and extend at least six inches (6 In) past frame. Place inlet grates over basket/frame to serve as fabric anchor.

D. Remove sediment deposit after each storm event and whenever accumulation exceeds one inch (1 In) depth during weekly inspections.

3.11 STRAW BALE FENCE CONSTRUCTION METHODS

A. Place bales in row with ends tightly abutting adjacent bales. Place bales with bindings parallel to ground surface.

B. Embed bale in soil a minimum of four inches (4 In).

C. Securely anchor bales in place with Straw Bale Stakes driven through bales a minimum of eighteen inches (18 In) into ground. Angle first (1st) stake in each bale toward previously laid bale to force bales

together.

D. Fill gaps between bales with straw to prevent water from channeling between bales. Wedge carefully in order not to separate bales.

E. Replace with new straw bale fence every two months (2 Mos) or as required by the Project Manager.

3.12 BRUSH BERM CONSTRUCTION METHODS

A. Construct brush berm along contour lines by hand placing method. Do not use machine placement of brush berm.

B. Use woody brush and branches having diameter less than two inches (2 In) with six inches (6 In) overlap. Avoid incorporation of annual weeds and soil into brush berm.

C. Use a minimum height of eighteen inches (18 In) measured from top of existing ground at upslope toe to top of berm. Top width shall be twenty-four (24) inches minimum and side slopes shall be two to one (2:1) or flatter.

D. Embed brush berm into soil a minimum of four inches (4 In) and anchor using wire, nylon or polypropylene rope across berm with a minimum tension of fifty pounds (50 Lbs). Tie rope securely to eighteen inch (18 In) by three-eighths inch (3/8 In) diameter rebar stakes driven into ground on four foot (4 Ft) centers on both sides of berm.

3.13 STREET AND SIDEWALK CLEANING

A. Keep areas clean of construction debris and mud carried by construction vehicles and equipment. If necessary, install stabilized construction exits at construction, staging, storage, and disposal areas, following Section 01575 Stabilized Construction Exit.

B. In lieu of or in addition to stabilized construction exits, shovel or sweep pavements as required to keep areas clean. Do not waterhose or sweep debris and mud off street into adjacent areas, except, hose sidewalks during off-peak hours, after sweeping.

3.14 WASTE COLLECTION AREAS

A. Prevent water runoff from passing through waste collection areas, and prevent water runoff from waste collection areas migrating outside collection areas.

3.15 EQUIPMENT MAINTENANCE AND REPAIR

A. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose, so fuels, lubricants, solvents, and other potential pollutants are not washed directly into receiving streams or storm water conveyance systems. Provide these areas with adequate waste disposal receptacles for liquid and solid waste. Clean and inspect maintenance areas daily.

B. Where designated equipment maintenance areas are not feasible, take precautions during each individual repair or maintenance operation to prevent potential pollutants from washing into streams or conveyance systems. Provide temporary waste disposal receptacles.

3.16 VEHICLE/EQUIPMENT WASHING AREAS

A. Install wash area (stabilized with coarse aggregate) adjacent to stabilized construction exit(s), as required to prevent mud and dirt run-off. Release wash water into drainage swales or inlets protected by erosion and sediment controls. Build wash areas following Section 01575 Stabilized Construction Exit. Install gravel or rock base beneath wash areas.

B. Wash vehicles only at designated wash areas. Do not wash vehicles such as concrete delivery trucks or dump trucks and other construction equipment at locations where runoff flows directly into watercourses or storm water conveyance systems.

C. Locate wash areas to spread out and evaporate or infiltrate wash water directly into ground, or collect runoff in temporary holding or seepage basins.

3.17 WATER RUNOFF AND EROSION CONTROL

A. Control surface water, runoff, subsurface water, and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.

B. Control fill, grading and ditching to direct water away from excavations, pits, tunnels, and other construction areas, and to direct drainage to proper runoff courses to prevent erosion, sedimentation or damage.

C. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

D. Dispose of drainage water to prevent flooding, erosion, or other damage to the site or adjoining areas. Follow environmental requirements.

E. Retain existing drainage patterns external to the site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover as required to control conditions.

F. Plan and execute construction and earth work to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

1. Hold area of bare soil exposed at one (1) time to a minimum.

2. Provide temporary controls such as berms, dikes, and drains.

G. Construct fill and waste areas by selective placement to eliminate surface silts or clays which shall erode.

H. Inspect earthwork periodically to detect start of erosion. Immediately apply corrective measures as required to control erosion.

I. Dispose of sediments offsite, not in or adjacent to streams or floodplains, nor allow sediments to flush into streams or drainage ways. Assume responsibility for offsite disposal location.

J. Unless otherwise indicated, compact embankments, excavations, and trenches by mechanically blading, tamping, and rolling soil in a maximum of eight inch (8 In) layers. Provide compaction density at a minimum ninety-five percent (95%) Standard Proctor ASTM D698-78 density. Make at least one (1) test per five hundred cubic yards (500 Cy) of embankment.

K. Do not maneuver vehicles on areas outside of dedicated rights-of-way and easements for construction. Immediately repair damage to erosion and sedimentation control systems caused by construction traffic.

L. Do not damage existing trees intended to remain.

3.18 REMOVAL OF CONTROLS

A. Remove erosion and sediment controls when the site is finally stabilized or as directed by the Project Manager.

B. Dispose of sediments and waste products following Section 01505 □ Temporary Facilities and Control.

END OF SECTION

SECTION 01575

STABILIZED CONSTRUCTION EXIT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Installation of erosion and sediment control for stabilized construction exits used during construction and prior to final development of site.

1.2 MEASUREMENT AND PAYMENT

A. Unit Price Contracts. If Contract is Unit Price Contract, payment for work in this Section will be based on the following:

1. Stabilized construction roads, parking areas, exits and truck-washing areas: per square yard of aggregate placed in eight inch (8 In) layers. No separate payment will be made for street cleaning necessary to meet TPDES requirements. Include cost of work for street cleaning under related Technical Specification section.

B. Total Stipulated Price (Lump Sum) Contracts. If the Contract is a Total Stipulated Price Contract, include payment for work under this Section in the Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturers catalog sheets and other Product Data on geotextile fabric.

C. Submit sieve analysis of aggregates conforming to requirements of this Technical Specification.

1.4 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D 4632 -Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01330 Submittal Procedures.

2. Section 01570 Storm Water Pollution Control.

C. Storm Water Management Plan Manual prepared by the City of Friendswood.

PART II: PRODUCTS

2.1 GEOTEXTILE FABRIC

A. Provide woven or non-woven geotextile fabric made of polypropylene, polyethylene, ethylene, or polyamide material.

B. Geotextile fabric: Minimum grab strength of two hundred seventy pounds per square inch (270 psi) in any principal direction (ASTM D-4632) and equivalent opening size between fifty millimeters (50 mm) and one hundred forty millimeters (140 mm).

C. Geotextile and threads: Resistant to chemical attack, mildew, and rot and contain ultraviolet ray inhibitors and stabilizers to provide minimum of six months (6 Mos) of expected usable life at temperature range of zero degrees Fahrenheit (0° F) to one hundred twenty degrees Fahrenheit (120° F).

D. Representative Manufacturers: Mirafi, Inc. or equal.

2.2 COARSE AGGREGATES

A. Coarse aggregate: Crushed stone, gravel, crushed blast furnace slag, or combination of these materials. Aggregate shall be composed of clean, hard, durable materials free from adherent coatings of, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

B. Coarse aggregates shall conform to gradation requirements in TABLE 4.1 GRADATION REQUIREMENTS FOR COARSE AGGREGATES in this Section.

PART III: EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Provide stabilized construction roads and exits at construction staging,

parking, storage and disposal areas to keep streets clean of mud carried by construction vehicles and equipment. Construct erosion and sediment controls in accordance with the Drawings and Technical Specification requirements.

B. Do not clear grub or rough cut until erosion and sediment control systems are in place, unless approved by the Project Manager to allow soil testing and surveying.

C. Maintain existing construction site erosion and sediment control systems until acceptance of the Work or until removal of existing systems is approved by the Project Manager.

D. Regularly inspect, repair or replace components of stabilized construction exits. Unless otherwise directed, maintain stabilized construction roads and exits until the City accepts the Work. Remove stabilized construction roads and exits promptly when directed by the Project Manager. Discard removed materials off-site.

E. Remove and dispose of sediment deposits at designated spoil site for the Project. If a spoil site is not designated on the Drawings, dispose of sediment off-site at a location not in or adjacent to stream or flood plain. Assume responsibility for off-site disposal.

F. Spread compacted and stabilized sediment evenly throughout site. Do not allow sediment to flush into streams or drainage ways. Dispose of contaminated sediment in accordance with existing federal, state, and local rules and regulations.

G. Prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Immediately repair damage to erosion and sediment control systems caused by construction traffic.

H. Conduct construction operations in conformance with erosion control requirements of Section 01570 Storm Water Pollution Control.

3.2 CONSTRUCTION METHODS

A. Provide stabilized access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes where shown on the Drawings.

B. Provide stabilized construction exits and truck washing areas, when approved by the Project Manager, of sizes and at locations shown on the Drawings or as specified in this Section.

C. Clean tires to remove sediment on vehicles leaving construction areas prior to entering public right-of-ways. Construct truck washing areas needed to remove sediment. Wash trucks on stabilized areas that drain into drainage systems protected by erosion and sediment control measures.

D. Details for stabilized construction exits are shown on the Drawings. Construct other stabilized areas to same requirements. Maintain minimum roadway widths of fourteen feet (14 Ft) for one-way traffic and twenty feet (20 Ft) for two-way traffic and of sufficient width to allow ingress and egress. Place geotextile fabric as a permeable separator to mixing of coarse aggregate with underlying soil. Limit exposure of geotextile fabric to elements between laydown and cover to a maximum fourteen days (14 D) to minimize potential damage.

E. Grade roads and parking areas to provide sufficient drainage away from stabilized areas. Use sandbags, gravel, boards, or similar materials to prevent sediment from entering public right-of-ways, receiving streams or storm water conveyance systems.

F. Inspect and maintain stabilized areas daily. Provide periodic top dressing with additional coarse aggregates to maintain required depth. Repair and clean out damaged control systems used to trap sediment. Immediately remove spilled, dropped, washed, or tracked sediment from public right-of- ways.

G. Maintain lengths of stabilized areas as shown on the Drawings or a minimum of fifty feet (50 Ft). Maintain a minimum thickness of eight inches (8 In). Maintain minimum widths at all points of ingress or egress.

H. Stabilize other areas with the same thickness, and width of coarse aggregate required for stabilized construction exits, except where shown otherwise on the Drawings.

I. Stabilized areas may be widened or lengthened to accommodate truck washing areas when authorized by the Project Manager.

J. Clean streets daily before end of workday. When excess sediments have tracked onto streets, the Project Manager may direct the Contractor to clean street as often as necessary. Remove and legally dispose of sediments.

K. Use other erosion and sediment control measures to prevent sediment runoff during rain periods and non-working hours and when storm discharges are expected.

PART IV: TABLES

4.1 GRADATION REQUIREMENTS FOR COARSE AGGREGATES

SIEVE SIZE (Square Mesh)	**PERCENT RETAINED (By Weight)**
2-1/2□	0%
2□	0% - 20%
1-1/2□	15% - 50%
3/4"	60% - 80%
No. 4	95% - 100%

END OF SECTION

SECTION 01580

WASTE MATERIAL DISPOSAL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Disposal of waste material and salvageable material.

1.2 SUBMITTALS

A. Conform to requirements of Section 01330 -Submittal Procedures.

B. Submit copy of approved "Development Permit", as defined in Chapter 34, Article II, Section 34-32 of City of Friendswood Code of Ordinances, prior to disposal of excess material in areas designated as being in "100-year Flood Hazard Area" within the City. Contact the City of Friendswood Flood Plain Manager, 910 S. Friendswood Drive, at (281) 996-3201 for flood plain information.

C. Obtain and submit disposal permits for proposed disposal sites, if required by local ordinances.

D. Submit copy of written permission from property owner, with description of property, prior to disposal of excess material adjacent to the Project. Submit written and signed release from property owner upon completion of disposal work.

E. Describe waste materials expected to be stored on-site and a description of controls to reduce Pollutants from these materials, including storage practices to minimize exposure of materials to storm water; and spill prevention and response measures in the Project's Storm Water Pollution Prevention Plan (SWPPP). Refer to Section 01410 TPDES Requirements.

1.3 REFERENCES

A. CFCO City of Friendswood Code of Ordinances.

1. Chapter 34 Flood Damage Prevention.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01330 Submittal Procedures.

2. Section 01410 TPDES Requirements.

PART II: PRODUCTS NOT USED

PART III: EXECUTION

3.1 SALVAGEABLE MATERIAL

A. Excavated Material: When indicated on the Drawings, load, haul, and deposit excavated material at location or locations shown on the Drawings outside limits of the Project.

B. Base, Surface, and Bedding Material: Load shell, gravel, bituminous, or other base and surfacing material designated for salvage into City trucks.

C. Pipe Culvert: Load culverts designated for salvage into City trucks.

D. Other Salvageable Materials: Conform to requirements of individual Technical Specification Sections.

E. Coordinate loading of salvageable material on City trucks with the Project Manager.

3.2 EXCESS MATERIAL

A. Remove and legally dispose of vegetation, rubble, broken concrete, debris, asphaltic concrete pavement, excess soil, and other materials not designated for salvage from job site.

B. Excess soil may be deposited on private property adjacent to the Project when written permission is obtained from property owner. See Paragraph 1.2.D above.

C. Verify flood plain status of any proposed disposal site. Do not dispose of excavated materials in area designated as within 100-year Flood Hazard Area unless "Development Permit" has been obtained. Remove excess material placed in "100-year Flood Hazard Area" within the City, without "Development Permit", at no additional cost to the City.

D. Remove waste materials from site daily, in order to maintain site in neat and orderly condition.

END OF SECTION

SECTION 01585

CONTROL OF GROUND AND SURFACE WATER

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations and foundation beds in stable condition, and controlling ground water conditions for tunnel excavations.

B. Protecting work against surface runoff and rising floodwaters.

C. Trapping suspended sediment in the discharge from the surface and ground water control systems.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES:

1. Measurement for control of ground water, if included in Document 00300 Unit Price Form, will be on either a lump sum basis or a linear foot basis for continuous installations of wellpoints, eductor wells, or deep wells.

2. If not included in Document 00300 Unit Price Form, include the cost to control ground water in unit price for work requiring such controls.

3. No separate payment will be made for control of surface water. Include cost to control surface water in unit price for work requiring controls.

4. Follow Section 01270 Measurement and Payment for unit price procedures.

B. Total Stipulated Price (Lump Sum) Contract.

1. If the Contract is a Total Stipulated Price Contract, include payment for work under this Section in the Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D698 Standard Test Methods for Laboratory Compaction of Soils Using Standard Effort (12,400 ft-lbf/ft^3 (600kN-m/m^3).

B. CFTS City of Friendswood Technical Specifications.

1. Document 00300 Unit Price Forms.

2. Section 01270 Measurement and Payment.

C. CFSWMP City of Friendswood Storm Water Management Plan manual.

D. Federal Regulations.

1. Federal Regulation 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

E. TCEQ Texas Commission on Environmental Quality.

F. TWWDA Texas Water Well Drillers Association.

1.4 DEFINITIONS

A. Ground water control system: system used to dewater and depressurize water-bearing soil layers.

1. Dewatering: Lowering the water table and intercepting seepage that would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts; and disposing of removed water. Intent of dewatering is to increase stability of tunnel excavations and excavated slopes, prevent dislocation of material from slopes or bottoms of excavations, reduce lateral loads on sheeting and bracing, improve excavating and hauling characteristics of excavated material, prevent failure or heaving of bottom of excavations, and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.

2. Depressurization: Includes reduction in piezometric pressure within strata not controlled by dewatering alone, necessary to prevent failure or heaving of excavation bottom or instability of tunnel excavations.

B. Excavation drainage: Includes keeping excavations free of surface and seepage water.

C. Surface drainage: Includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines necessary to protect Work from any source of surface water.

D. Monitoring facilities for ground water control system: Includes piezometers, monitoring wells and flow meters for observing and recording flow rates.

1.5 PERFORMANCE REQUIREMENTS

A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems. Submit proposed method and spacing of readings for review prior to obtaining water level readings.

B. Design ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Section 02280 -Trench Safety Systems, to produce following results:

1. Effectively reduce hydrostatic pressure affecting:

   a. Excavations.

   b. Tunnel excavation, face stability or seepage into tunnels.

2. Develop substantially dry and stable subgrade for subsequent construction operations.

3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities and other work.

4. Prevent loss of fines, seepage, boils, quick condition, or softening of foundation strata.

5. Maintain stability of sides and bottom of excavations.

C. Provide ground water control systems that include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.

D. Provide drainage of seepage water and surface water, as well as water

from other sources entering excavation. Excavation drainage may include placement of drainage materials, crushed stone and filter fabric, together with sump pumping.

E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.

F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, adjacent water wells, or potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of system to protect property as required.

H. Install an adequate number of piezometers installed at proper locations and depths, necessary to provide meaningful observations of conditions affecting excavation, adjacent structures and water wells.

I. Install environmental monitoring wells at proper locations and depths necessary to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into work area or ground water control system.

1.6 SUBMITTALS

A. Conform to requirements of Section 01330 Submittals Procedures.

B. Submit Ground Water and Surface Water Control Plan for review by the Project Manager prior to start of excavation work. Include the following:

1. Results of subsurface investigations and description of extent and characteristics of water bearing layers subject to ground water control.

2. Names of equipment Suppliers and installation Subcontractors.

3. Description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria and operation and maintenance procedures.

4. Description of proposed monitoring facilities indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.

5. Description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.

6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.

7. Operating requirements, including piezometric control elevations for dewatering and depressurization.

8. Excavation drainage methods including typical drainage layers, sump pump application and other means.

9. Surface water control and drainage installations.

10. Proposed methods and locations for disposing of removed water.

C. Submit following records upon completion of initial installation:

1. Installation and development reports for well points, eductors, and deep wells.

2. Installation reports and baseline readings for piezometers and monitoring wells.

3. Baseline analytical test data of water from monitoring wells.

4. Initial flow rates.

D. Submit the following records weekly during control of ground and surface water operations:

1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to Paragraph 3.2, Requirements for Eductor, Well Points, or Deep Wells.

2. Maintenance records for ground water control installations, piezometers and monitoring wells.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of agencies having jurisdiction.

B. Comply with Texas Commission on Environmental Quality (TCEQ) regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.

C. Obtain necessary permits from agencies with jurisdiction over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Since review and permitting process may be lengthy, take early action to obtain required approvals.

D. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites.

PART II: PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Select equipment and materials necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review by the Project Manager through submittals required in Paragraph 1.6, Submittals.

B. Use experienced contractors, regularly engaged in ground water control system design, installation, and operation, to furnish and install and operate eductors, well points, or deep wells, when needed.

C. Maintain equipment in good repair and operating condition.

D. Keep sufficient standby equipment and materials available to ensure continuous operation, where required.

E. Portable Sediment Tank System: Standard fifty-five gallon (55 Gal) steel or plastic drums, free of hazardous material contamination.

1. Shop or field fabricate tanks in series with main inlet pipe, inter-tank pipes and discharge pipes, using quantities sufficient to collect sediments from discharge water.

PART III: EXECUTION

3.1 GROUND WATER CONTROL

A. Perform necessary subsurface investigation to identify water bearing layers, piezometric pressures and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine draw down characteristics. Present results in the Ground Water and Surface Water Control Plan submittal.

B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in manner compatible with construction methods and site conditions. Monitor effectiveness of installed system and its effect on adjacent property.

C. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify the Project Manager in writing of changes made to accommodate field conditions and changes to Work. Provide revised drawings and calculations with notification.

D. Provide continuous system operation, including nights, weekends, and holidays. Arrange appropriate backup if electrical power is primary energy source for dewatering system.

E. Monitor operations to verify systems lower ground water piezometric levels at rate required to maintain dry excavation resulting in stable subgrade for subsequent construction operations.

F. Depressurize zones where hydrostatic pressures in confined water bearing layers exist below excavations to eliminate risk of uplift or other instability of excavation or installed works. Define allowable piezometric elevations in the Ground Water and Surface Water Control Plan.

G. Removal of ground water control installations.

1. Remove pumping system components and piping when ground water control is no longer required.

2. Remove piezometers, including piezometers installed during design phase investigations and left for the Contractor's use, upon completion of testing, as required in accordance with Part III of applicable specification.

3. Remove monitoring wells when directed by the Project Manager.

4. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

H. During backfilling, maintain water level a minimum of five feet (5 Ft) below prevailing level of backfill. Do not allow the water level to cause uplift pressures in excess of eighty percent (80%) of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement-stabilized sand until at least forty-eight hours (48 Hrs) after placement.

I. Provide uniform pipe diameter for each pipe drain run constructed for dewatering. Remove pipe drains when no longer required. If pipe removal is impractical, grout connections at fifty foot (50 Ft) intervals and fill pipe with cement-bentonite grout or cement-sand grout after removal from service.

J. The extent of ground water control for structures with permanent perforated underground drainage systems may be reduced, for units designed to withstand hydrostatic uplift pressure. Provide a means to drain affected portions of underground systems, including standby equipment. Maintain drainage systems during construction operations.

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

L. Compact backfill to not less than ninety-five percent (95%) of maximum dry density in accordance with ASTM D698.

M. Foundation Slab: Maintain saturation line at least three feet (3 Ft) below lowest elevations where concrete is to be placed. Drain foundations in areas where concrete is to be placed before placing reinforcing steel. Keep free from water for three days (3 D) after concrete is placed.

3.2 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For aboveground piping in ground water control system, include a twelve inch (12 In) minimum length of clear, transparent piping between each eductor well or well point and discharge header to allow visual monitoring of discharge from each installation.

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

monitoring wells for tunneling as appropriate for selected method of work.

C. Install piezometers or monitoring wells at least one week (1 Wk) in advance of the start of associated excavation.

D. Dewatering may be omitted for portions of under drains or other excavations, where auger borings and piezometers or monitoring wells show that soil is pre-drained by existing systems and that ground water control plan criteria are satisfied.

E. Replace installations that produce noticeable amounts of sediments after development.

F. Provide additional ground water control installations, or change method of control if, ground water control plan does not provide satisfactory results based on performance criteria defined by plan and by specifications. Submit revised plan according to Paragraph 1.6.B.

3.3 SEDIMENT TRAPS

A. Install sediment tank as shown on approved plan.

B. Inspect daily and clean out tank when one-third (1/3) of sediment tank is filled with sediment.

3.4 SEDIMENT SUMP PIT

A. Install sediment sump pits as shown on approved plan.

B. Construct standpipe by perforating twelve inch (12 In) to twenty-four inch (24 In) diameter corrugated metal or PVC pipe.

C. Extend standpipe twelve inches (12 In) to eighteen inches (18 In) above lip of pit.

D. Convey discharge of water pumped from standpipe to sediment trapping device.

E. Fill sites of sump pits, compact to density of surrounding soil and stabilize surface when construction is complete.

3.5 EXCAVATION DRAINAGE

A. Use excavation drainage methods if well-drained conditions can be achieved. Excavation drainage may consist of layers of crushed stone and filter fabric, and sump pumping, in combination with sufficient

ground water control wells to maintain stable excavation and backfill conditions.

3.6 MAINTENANCE AND OBSERVATION

A. Conduct daily maintenance and observation of piezometers or monitoring wells while ground water control installations or excavation drainage is operating at the site, or water is seeping into tunnels, and maintain systems in good operating condition.

B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedules.

C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make specified observations.

D. Remove and grout piezometers inside or outside of excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the Project Manager.

3.7 MONITORING AND RECORDING

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

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

3.8 SURFACE WATER CONTROL

A. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. Requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

B. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having

jurisdiction. Provide settling basins when required by agencies.

END OF SECTION

SECTION 01610

APPROVED PRODUCTS LIST

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Specify that materials and products that have been tested and approved for use in the City of Friendswood.

B. No separate payment shall be made for items listed in this Section. Cost of items shall be included in the individual Bid item in Document 00300 Unit Price Form.

1.2 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Document 00300 Unit Price Form.

2. Section 01330 Submittal Procedures.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

PART II: PRODUCTS

2.1 WATER PRODUCTS

A. FIRE HYDRANTS [Steamer Nozzle four and one-eighth inches (4.125 In), pumper nozzle two and one-half inches (2.5 In), N.S.T. Thread].

1. Mueller Model: Centurion, Modern Centurion, Super Centurion.

2. American Darling Model B84-B or B-62-B.

B. VALVES (AWWA Approved resilient Wedge Type).

1. Mueller.

2. American Darling.

C. BRASS GATE VALVES three □quarter inch (3/4 In) thru two inch (2 In).

1. Hammond.
2. Watts.
3. Red and White.
4. Matco Norca.
5. Eagle.
6. C and K.

D. CHECK VALVES

1. Swing Check.
2. Mueller.

E. POLYVINYL CHLORIDE (PVC) PIPE (AWWA C900).

1. J-M Pipe.
2. Certainteed.
3. Capco.

F. DUCTILE IRON PIPE (DIP) (AWWA C151, C150 and C600).

1. US Pipe.
2. American.
3. McWane.
4. Tyler Pipe.
5. Griffin.

G. DUCTILE IRON PIPE (DIP) COATINGS [AWWA C104 (ANSI A21.4)].

1. Various Manufacturers (upon approval).

H. FITTINGS [D.I.P., AWWA C153/A21.53.84, AWWA C110(ANSI 21.10)].

1. US Pipe.

2. American.

3. Star.

4. Sigma.

5. Union.

6. Tyler Pipe/Fittings.

7. Divco Tee/Valve.

I. STEEL PIPE (AWWA C200).

1. Various Manufacturers (upon approval).

J. STEEL PIPE COATINGS, EXTERIOR (AWWA C203).

1. Various Manufacturers (upon approval).

K. STEEL PIPE COATINGS, INTERIOR (AWWA C210, AWWA D102, TCEQ NSF61).

1. Various Manufacturers (upon approval).

L. CURB STOP [Bronze, Ball Valve, three hundred sixty degree (360°) Rotation, Locking Wing].

1. Ford.

M. CORPORATION STOPS (Bronze).

1. Ford Model: F100.

N. SERVICE SADDLE DOUBLE STRAP (Bronze or Brass, with CC Tap).

1. Ford.

O. SERVICE SADDLE SINGLE STRAP (Stainless Steel, Epoxy Coated Inside).

1. Romac.

2. Smith Blair.

P. WATER METERS (AWWA Approved).

1. Sensus (Old Rockwell).

Q. SERVICE TUBBNG.

1. Plastic SDR9 Class 200 Polyethylene.

   a. Driscopipe.

   b. Continental.

   c. Orangeburg.

2. Copper.

   a. Mueller-Streamline.

   b. Holstaf.

   c. Wolverine.

   d. Cerro (Type K).

R. TAPPING SLEEP AND VALVE (Stainless Steel, Full Clamp, MJ Valve).

1. JCM.

2. Mueller.

3. Smith Blair.

4. Romac.

5. American.

6. Power Seal.

7. Clow.

8. Tyler Pipe.

9. US Pipe

S. AIR RELEASE VALVE [Two inch (2 In), Bonney Forge 3,000# threadolet].

1. APCO □ No. 145-c

T. METER BOXES

1. Plastic.

   a. DFW.

   b. Gross.

   c. Brooks Products.

2. Concrete.

   a. Brooks Products.

   b. Southern Precast.

U. POLYETHYLENE ENCASEMENT TUBING (8 Mil Minimum, ANSI/AWWA C105).

1. Various Manufacturers (upon approval).

2.2 SANITARY SEWER PRODUCTS

A. GRAVITY FLOW PIPES (AWWA 150, AWWA 151, C600, C900).

1. P.V.C. < twelve inch (12 In) □ SDR 26, minimum one hundred sixty pounds per square inch (160 psi) Ratings, flow line < twelve feet (12 Ft).

2. P.V.C. > twelve inch (12 In) □ SDR 25, one hundred sixty-five pounds per square inch (165 psi) Rating.

3. P.V.C., flow line > twelve feet (12 Ft) □ SDR 18, C900.

4. P.V.C., SDR 21, flow line < twelve feet (12 Ft).

5. Ductile Iron Pipe, Class 51 bituminous coated, C600.

B. FORCE MAIN.

1. Ductile Iron Pipe, Class 51 with forty (40) mil polyliner.

2. P.V.C., SDR 18, C900.

C. COATING FOR MANHOLES [forty (40) mils. Minimum Thickness].

1. Strong Seal MS-2.

D. LIFT STATION SUBMERSIBLE PUMPS.

1. Flyght.
2. ABS.
3. Gorman Rupp.

E. LIFT STATION CONTROL PANELS

1. E.G. Controls.
2. Consolidated Electric.
3. Murphymatic.
4. Sta-Con, Inc.
5. Automatic Control Systems.

F. NON-SHRINK GROUT.

1. Fosrok Preco Patch.

G. MANHOLE COVER (City of Friendswood Standards) and Rings.

1. East Jordan Ironworks.
2. Star Pipe Products, Inc.
3. Vulcan S. VM 18.

H. ENGINEERING FABRICS.

1. Trevira S1114.

I. MANHOLE INSERTS (No Flo/In-Flow Protector).

1. Contractor Specialties and Supply Co.

J. SEWER FITTING.

1. GPK.

2. Multi Fitting (3034 OD).

3. Head.

4. J-M pipe/fittings.

5. Vassallo.

6. Plastic Trends.

K. PIPE CONNECTORS/FLEXIBLE COUPLINGS.

1. Flow Control.

2. Flow Seal.

3. DFW.

L. MANHOLES (Concrete Prefab).

1. Moor-Tex.

2. Southern Precast.

3. Calvert.

4. Gifford Hill.

5. Brooks Products.

6. Dalworth.

7. Rinker.

2.3 STORM SEWER PRODUCTS

A. ENGINEERING FABRICS.

1. Trevira S1114.

B. MANHOLE COVERS (City of Friendswood), Rings and Inlet Grates.

1. East Jordan Iron Works

2. Star Pipe Products, Inc.

3. Vulcan □S. VM 19 Mod-32 inch,

C. REINFORCED CONCRETE PIPE (ASTM C76, ANSI/ASTM C443, ASTM C506, ASTM C507).

1. Various Manufacturers (upon approval).

D. CONCRETE BOX CULVERTS (ASTM C789).

1. Various Manufacturers (upon approval).

E. CORRUGATED METAL PIPE (AASHTO M-35-82, AASHTO C-361).

1. Aluminized Steel Type 2 (AASHTO M-274-791).

a. Various Manufacturers (upon approval).

2. Precoated Galvanized Steel, ten (10) mil coating (AASHTO M-246).

a. Various Manufacturers (upon approval).

2.4 STREET PRODUCTS

A. RAISED PAVEMENT MARKERS (Class A,B,C & D).

1. Apex Universal.

B. TYPE Y AND TYPE W TRAFFIC BUTTONS (ceramic only).

1. Apex Universal.

C. RAISED PAVEMENT MARKER ADHESIVE.

1. Bundy Raised Pavement Marker Adhesive.

D. THERMOPLASTIC PAVEMENT MARKINGS (125 mil thick).

1. Flint Trading Inc. □Premark LKF Roadmarking Material.

E. PREFABRICATED PAVEMENT MARKINGS (125 mil thick).

1. Flint Trading Inc. □Premark LKF Roadmarking Material.

F. THERMOPLACTIC ADHESIVE.

1. Ashland Chemicals □Pliobond 10.

G. CRACK AND JOINT SEALANT.

1. Elastometric-type, Hot-pour Joint Sealant conforming to TxDOT Item 433 and TxDOT Departmental Material Specification D-9-6310. (various mfrs.).

H. PAINTS.

1. Only Water Based conforming to TxDOT Specifications are approved for use in the City of Friendswood (various mfrs.).

I. ROAD MARKER POSTS.

1. Carsonite #CRM-375.

J. REPLACEABLE DELINEATOR POST W/BASE [Epoxy or eight inch (8 In) Bundy Adhesive].

1. Repo Tm model.

K. CONCRETE CURING MEMBRANES.

1. Liquid membrane-forming Curing Compound conforming to TxDOT Item 526 and TxDOT Departmental Material Specification D-9-8120 (various mfrs.).

2.5 APPROVAL REQUIRED

A. Materials and manufactured items used in construction of a public infrastructure project shall be approved by the City of Friendswood prior to installation. Water, sanitary, storm and street system appurtenances shall be subject to the approved items as listed in the above Approved Products List. Items not appearing on this approved list shall not be used for construction of public infrastructure facilities in the City of Friendswood without prior approval.

PART III: EXECUTION NOT USED

END OF SECTION

SECTION 01630

PRODUCT SUBSTITUTION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Options for making Product or process selections.

B. Procedures for proposing equivalent Products or processes, including pre-approved, pre-qualified, and approved Products or processes.

1.2 DEFINITIONS

A. Product: As defined in Section 00500 General Conditions. Product does not include machinery and equipment used for production, fabrication, conveying, and erection of the Work. Products may also include existing materials or components designated for reuse.

B. Process: Any proprietary system or method for installing system components resulting in an integral, functioning part of the Work. For this Section, the word Products includes Processes.

1.3 SELECTION OPTIONS

A. Pre-approved Products: Construction products of certain manufacturers or Suppliers designated in Technical Specifications as "pre-approved." Products for this project are designated as pre-approved in the Technical Specifications. Products of other manufacturers or suppliers are not acceptable for this Project and shall not be considered under the submittal process for approving alternate products.

B. Pre-qualified Products: Construction products of certain manufacturers or Suppliers designated in the Technical Specifications as "pre-qualified." Pre-qualified Products for this Project are designated as pre-qualified in the Technical Specifications. Products of other manufacturers or suppliers shall not be acceptable for this Project and shall not be considered under the submittal process for approving alternate products.

C. Approved Products: Construction products of certain manufacturers or Suppliers designated in the Technical Specifications followed by words "or approved equal." Approval of alternate products not listed in the Technical Specifications may be obtained through provisions for;

product options and substitutions in Section 00500 General Conditions, and by following submittal procedures specified in Section 01330 Submittal Procedures. The procedure for approval of alternate products is not applicable to pre-approved or pre-qualified products.

D. Product Compatibility: To the maximum extent possible, provide Products that are of the same type or function from a single manufacturer, make, or source. Where more than one (1) choice is available, select Product that is compatible with other Products already selected, specified, or in use by the City.

1.4 CONTRACTOR'S RESPONSIBILITY

A. Responsibility related to Product options and substitutions is defined in Section 00500 General Conditions.

B. Furnish information the Project Manager deems necessary to judge equivalency of alternate Product.

C. Pay for laboratory testing, as well as any other review or examination costs, needed to establish equivalency between products in order to obtain information upon which the Project Manager can base a decision.

D. If the Project Manager determines alternate product is not equal to that named in Technical Specifications, furnish one (1) of the specified Products.

1.5 CITY REVIEW

A. Use alternate Products only when approved in writing by the Project Manager. The Project Manager's determination regarding acceptance of proposed alternate Product is final.

B. Alternate Products shall be accepted if Products are judged by the Project Manager to be equivalent to specified Product or to offer substantial benefit to the City.

C. The City retains the right to accept any Product deemed advantageous to the City, and similarly, to reject any product deemed not beneficial to the City.

1.6 SUBSTITUTION PROCEDURE

A. Collect and assemble technical information applicable to the proposed Product to aid in determining equivalency as related to the approved Product specified.

B. Submit a written request for a construction Product to be considered as an alternate Product.

C. Submit Product information after the effective date of the Contract and within the time period allowed for substitution submittals given in Section 00500 General Conditions. After the submittal period has expired, requests for alternate Products shall be considered only when specified Product becomes unavailable because of conditions beyond the Contractor's control.

D. Submit a minimum of three (3) copies of each request for alternate Product approval. Include the following information:

1. Complete data substantiating compliance of proposed substitution with the Contract.

2. For Products:

   a. Product identification, including manufacturer's name and address.

   b. Manufacturer's literature with Product description, performance and test data, and reference standards.

   c. Samples, as applicable.

   d. Name and address of similar projects on which Product was used and date of installation. Include names of Owner, design consultant, and installing contractor.

3. For construction methods:

   a. Detailed description of proposed method.

   b. Drawings illustrating methods.

4. Itemized comparison of proposed substitution with Product or method specified.

5. Data relating to changes in Construction Schedule.

6. Relation to separate contracts, if any.

7. Accurate cost data on proposed substitution in comparison with Product or method specified.

8. Other information requested by the Project Manager.

E. Approved alternate Products will be subject to the same review process as the specified Product would have been for Shop Drawings, Product Data, and Samples.

PART II: PRODUCTS □ NOT USED

PART III: EXECUTION □ NOT USED

END OF SECTION

Section 01640

CLEANING AND ADJUSTING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. The Contractor shall be responsible for cleaning and adjusting the Work. If the Contractor fails to clean and adjust the Work, the City may do so and charge the resulting costs to the Contractor.

B. Detailed cleaning and adjusting requirements for specific trades or work are specified in sections pertaining to that trade or work.

C. No separate payment shall be made for any cleaning or adjusting required under this Section. Include the cost of such work in the contract prices for items listed in the Bid Document.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Fire Protection Store volatile waste in covered metal containers and remove from premises daily.

B. Pollution Control Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws.

1. Burying of rubbish and materials on the project site shall not be permitted.

2. Disposal of volatile fluid wastes and other chemical wastes in storm or sanitary sewer systems or into streams or waterways shall not be permitted.

C. Safety Standards Maintain the project in accordance with insurance and safety standards.

PART II: PRODUCTS NOT USED.

PART III: EXECUTION

3.1 DURING CONSTRUCTION

A. Oversee cleaning to ensure that the premises are maintained free from accumulations of waste material and rubbish. Do not allow waste

materials, rubbish and debris to accumulate and become unsightly or create a hazard. Provide containers and locate on site for collection of waste materials, rubbish, and debris.

B. At reasonable intervals during progress of the Work, collect and dispose of waste materials, rubbish, and debris. Handle waste in a controlled manner; do not drop or throw materials from heights.

C. Remove waste materials, rubbish, and debris from the site and legally dispose at public or private dumping area off the project site.

3.2 FINAL CLEANING AND ADJUSTING

A. Use experienced personnel for final cleaning. Broom-clean paved surfaces; rake clean other surfaces of grounds. Remove all waste material and rubbish from the project area, as well as all tools, construction equipment, machinery, surplus materials, and temporary facilities.

B. Immediately prior to acceptance or occupancy, verify that exposed interior and exterior surfaces are properly cleaned.

3.3 ADJACENT AREAS

A. To the City's satisfaction, clean or repair adjacent areas affected by the construction, at no cost to the City. Remove dust and debris in the adjacent area. Repair, patch, and touch-up marred surfaces to match adjacent finishes.

END OF SECTION

SECTION 01725

FIELD SURVEYING

PART I: GENERAL

1.1 QUALITY CONTROL

A. Conform to the State of Texas laws for surveys requiring licensed surveyors registered in the State of Texas. Employ a surveyor acceptable to the Project Manager if required by the Contract.

1.2 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit name, address, and telephone number of the Surveyor to the Project Manager before starting survey work.

C. Submit documentation verifying accuracy of survey work on request.

D. Submit certificate signed by the Surveyor, that show elevations and locations of the Work are in conformance with the Contract.

1.3 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. Prepare a certified survey setting forth dimensions, locations, angles, and elevations of construction and site work upon completion of foundation walls and major site improvements. Submit record documents under provisions of Section 01785 □ Project Record Documents.

1.4 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 00500 □ General Conditions.

2. Section 01330 □ Submittal Procedures.

3. Section 01785 □ Project Record Documents.

1.5 EXAMINATION

A. Verify locations of survey control points prior to starting the Work. Notify the Project Manager immediately if any discrepancies are discovered.

1.6 SURVEY REFERENCE POINTS

A. The City will establish survey control datum as provided in Section 00500 General Conditions and as indicated on the Drawings. Inform the Project Manager in advance of time horizontal and vertical control points will be established so verification deemed necessary by the Project Manager may be done with minimum inconvenience to the City or the Contractor.

B. Locate and protect survey control points prior to starting site work; preserve permanent reference points during construction.

C. Notify Project the Manager a minimum of forty-eight hours (48 Hrs) before relocation of reference points is needed due to changes in grades or other reasons.

D. Promptly report loss or destruction of reference points to the Project Manager.

E. Reimburse the City for cost of reestablishment of permanent reference points disturbed by construction operations.

1.7 SURVEY REQUIREMENTS

A. Utilize recognized engineering survey practices.

B. Establish a minimum of two (2) permanent benchmarks on site, referenced to established control points. Record horizontal and vertical location data in the Project Record Documents.

C. Establish elevations, lines and levels to provide quantities required for measurement and payment and for appropriate controls for the Work. Locate and lay out the following with appropriate instruments:

1. Site improvements including grading, fill and topsoil placement, utilities, and footings and slabs.

2. Grid or axis for structures.

3. Building foundation, column locations, and ground floor elevations.

D. Periodically verify layouts.

PART II: PRODUCTS □ NOT USED.

PART III: EXECUTION □ NOT USED.

END OF SECTION

SECTION 01730

CUTTING AND PATCHING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cutting, patching and fitting of the Work or work under construction. Coordinating Installation or connection of the Work to existing facilities, or uncovering work for access, inspection or testing and related submittals.

1.2 CUTTING AND PATCHING

A. Perform activities to avoid interference with facility operations and work of others in accordance with Section 00500 General Conditions of Contract.

B. Execute cutting and patching, including excavation, backfill and fitting to:

1. Remove and replace defective work or work not conforming to the Drawings and Technical Specifications;

2. Take samples of installed work as required for testing;

3. Remove construction required to provide for specified alterations or additions to existing work;

4. Uncover work to allow inspection or reinspection by the Project Manager or regulatory agencies having jurisdiction;

5. Connect uninstalled work to completed work in proper sequence;

6. Remove or relocate existing utilities and pipes that obstruct work;

7. Make connections or alterations to existing or new facilities;

8. Provide openings, channels, chases and flues and cut, patch, and finish; if required; or

9. Provide protection for other portions of the Work.

C. Restore existing work to a condition equal to or better than that which existed prior to cutting and patching, and to standards required by the Technical Specifications.

D. Support, anchor, attach, match, trim and seal materials to work of others. Unless otherwise specified, Furnish and Install sleeves, inserts, and hangers required for execution of the Work.

E. Provide shoring, bracing and support necessary to maintain structural integrity and to protect adjacent work from damage during cutting and patching. Request written approval from the Project Manager, before cutting structural members such as beams, anchors, lintels, or other supports. Follow approved submittals, as applicable.

F. Match new materials to existing materials by bonding, lapping, mechanically tying, anchoring or other effective means in order to prevent cracks and to minimize evidence of patching. Conceal effects of demolition and patching by blending new construction to existing surfaces. Avoid obvious breaks, joints or changes of surface appearance unless shown on the Drawings or authorized by the Project Manager.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit a written request to the Project Manager for consent to proceed, before conducting cutting operations that might affect structural integrity, design function, City operations, or work of another contractor.

C. Include the following in submittal:

1. Identification of Project.

2. Description of affected work.

3. Necessity for cutting.

4. Effect on other work and on structural integrity.

5. Describe the proposed work including:

a. Scope of cutting and patching.

b. Contractor, Subcontractor or Supplier who will execute the Work.

c. Proposed Products.

d. Extent of refinishing.

e. Schedule of operations.

6. Alternatives to cutting and patching.

D. When work conditions or schedules dictate the need for change of materials or methods, submit a written recommendation to the Project Manager that includes:

1. Conditions necessitating the change;

2. Recommendations for alternative materials or methods; and

3. Submittals required for proposed substitutions.

E. Notify the Project Manager in writing when work will be uncovered for observation. Do not begin cutting or patching operations until authorized by the Project Manager.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 00500 General Conditions.

2. Section 01330 Submittal Procedures.

1.5 CONNECTIONS TO EXISTING FACILITIES

A. Perform construction operations necessary to complete connections and tie-ins to existing facilities. Keep existing facilities in continuous operation unless otherwise permitted in the Technical Specifications or approved in writing by the Project Manager.

B. Coordinate interruption of service requiring connection to existing facilities with the Project Manager. Do not bypass wastewater or sludge to waterways. Provide temporary pumping facilities to handle wastewater if necessary. Use temporary bulkheads to minimize disruption. Provide temporary power and piping to facilitate construction where necessary.

C. Submit a detailed schedule of proposed connections, including shut-downs and tie-ins. Include proposed time and date as well as anticipated duration of work. Coordinate the connection schedule with

the construction schedule.

1. Submit specific times and dates to the Project Manager a minimum of forty-eight hours (48 Hrs) in advance of proposed work.

D. Procedures and Operations:

1. Operate existing pumps, valves and gates in required sequence under supervision of the Project Manager. Do not operate valves, gates or other items of equipment without the Project Manager s knowledge.

2. If possible, test equipment under operating conditions before making final tie-ins to connect equipment to existing facility.

3. Coordinate work and schedules: Notify the Project Manager a minimum of forty-eight hours (48 Hrs) before shutdowns or bypasses are required.

PART II: PRODUCTS NOT USED.

PART III: EXECUTION NOT USED.

END OF SECTION

SECTION 01735

PROCEDURE FOR VALVE ASSISTANCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. The City of Friendswood employees shall operate all existing valves. The Contractor's employees may operate new valves included in the Work prior to acceptance by the City.

1.2 PROCEDURE

A. Perform activities listed in this Section. Utility Division personnel shall also follow these procedures when completing a service request, Document 01740 – Utility Division Assistance Request, from individual Contractors, through Project Manager, for operation of existing water valves.

1.3 SUBMITTALS

A. Submit request for work order planning meetings in accordance with this Section.

1.4 REFERENCES

A. CFTS – City of Friendswood Technical Specifications.

1. Document 01740 – Utility Division Assistance Request.

1.5 CANCELLATION

A. The Contractor, the Project Manager, or Utilities Division may cancel a scheduled valve assistance appointment at no extra cost or payment to the Contractor. The Contractor shall notify the Project Manager a minimum of twenty-four hours (24 Hrs) in advance of scheduled valve operation. The Project Manager shall notify the Department of Public Works immediately upon receipt of cancellation notice. Cancellation may be caused by bad weather, preparation work taking longer than anticipated or unforeseen delays by one (1) or more of the three (3) parties.

PART II: PRODUCTS – NOT USED.

PART III: EXECUTION

3.1 ROUTINE VALVE ASSISTANCE REQUEST

A. When notified by the Contractor, the Project Manager shall schedule a work order planning meeting by sending Document 01740 Utility Division Assistance Request to the Department of Public Works and providing information shown below. The work order planning meeting shall be conducted a minimum of three days (3 D) prior to the date requested for valve operations; excluding weekends, holidays, inclement weather days, and the day of the call.

1. Project Name.
2. Project Number.
3. Location of the Work requested.
4. Date and time assistance requested.
5. Contractor's Name.
6. Superintendents Name.
7. Superintendents Phone Number.
8. Project Manager's Name.
9. Project Manager's Phone Number.

B. The Department of Public Works shall create a work order for each wet connection, cut and plug, etc.

C. The Department of Public Works shall give the Project Manager the work order number. This work order number must be used as a reference in all communications regarding this request for Valve Assistance.

D. Utility Division personnel must have the work order number on their route sheet. When Utility Division personnel arrive at the job site for the Work Order Planning Meeting between the Project Manager, the Contractor, and Utility Division personnel, they will verify the street intersection and work order number with the Project Manager before beginning Work Order Planning Meeting.

E. During Work Order Planning Meeting, the work to be performed will be outlined and the actual date the work shall be performed will be mutually determined by the Project Manager, the Contractor and City's Utility Division personnel, based upon relevant factors such as preparatory work needed, customer requirements, etc.

F. Utility Division personnel shall perform work specifically outlined in the work order requested. Also, Utility Division personnel shall operate only existing water valves. The Project Manager shall contact the Department of Public Works and request a new work order for additional work.

G. Utility Division personnel will contact the dispatcher and advise when the job is complete. Utility Division personnel will list all appropriate information on the Crew Activity Report.

H. Should Utility Division personnel not be able to keep an appointment to provide valve assistance, Utility Division shall provide notification to appropriate Project Manager by phone at least twenty-four hours prior (24 Hrs), with that fact and rescheduling information, if available.

I. The Project Manager shall notify the Department of Public Works if Utility Division personnel have not arrived at the site within thirty minutes (30 Min) of scheduled appointment. If the Contractor is not ready when Utility Division personnel arrives to provide valve assistance, the City shall charge the Contractor sixty-five dollars ($65.00) per hour, per employee, starting thirty minutes (30 Min) after the scheduled appointment time, minimum one hour (1 Hr) charge.

J. The Contractor shall not be due delay claims or downtime if Utility Division has notified the Project Manager that they will not be able to provide valve assistance as scheduled.

K. Test installed new valves in the presence of the Project Manager and the Utilities Supervisor during the substantial completion inspection. Place new valves in open position on or before the Date of Substantial Completion.

L. The Project Manager shall notify, in writing, the Department of Public Works one month (1 Mo) before the one year (1 Yr) maintenance bond expires to report any problems they have with new water lines. The Project Manager shall notify the Contractor about these problems.

3.2 EMERGENCY REQUEST FOR VALVE ASSISTANCE PROCEDURE

A. When notified by the Contractor, the Project Manager shall request emergency Valve Assistance due to a broken line/service, etc. by

calling the Department of Public Works at (281) 996-3382 and providing the following information:

1. Project Name.
2. Project Number.
3. Location of the Work requested.
4. Nature of the emergency.
5. Contractor's Name.
6. Superintendents Name.
7. Superintendents Phone Number.
8. Project Manager's Name.
9. Project Manager's Phone Number.

B. The Department of Public Works shall create an emergency work order number and describe the work to be performed.

C. The Department of Public Works shall give the Project Manager the emergency work order number. Reference work order number in all communications regarding request for Valve Assistance.

D. The Department of Public Works shall contact Utility Division personnel and assign the emergency work order.

E. Utility Division personnel must have the emergency work order number on the route sheet. When Utility Division personnel arrive at the job site for emergency work, they shall verify the street intersection and emergency work order number with the Project Manager prior to beginning the work requested for operating existing water valves. Utility Division personnel shall coordinate verification of street intersection and work order number with the Project Manager prior to performing work.

3.3 AFTER HOURS EMERGENCY VALVE ASSISTANCE

A. If, after normal working hours, it becomes necessary for valve assistance, the Contractor or the Project Manager shall call the Police Dispatcher at (281) 996-3300 and supply said dispatcher with the following information:

1. Caller's Name.

2. Caller's Title.

3. Caller's Employer.

4. Nature of the emergency.

5. Location of the emergency.

B. The Dispatcher shall follow standard procedures and notify the Utility Division Person On-call and relay this information.

C. The Utility Division Person On-call shall notify the Project Manager of the emergency and both shall go to the location and assess the emergency situation.

D. The Utility Division Person On-call shall determine if other personnel are needed, and procedure to call them in as needed. The Utility Division Person On-call shall document all activities, equipment, personnel and time used, and will send it to the Department of Public Works the following regular business day.

END OF SECTION

DOCUMENT 01740

UTILITY DIVISION ASSISTANCE REQUEST

DATE REQUESTED: {INSERT DATE}

TIME REQUESTED: {INSERT TIME}

Type of Assistance Required:

☐ Valve Operation ☐ Water and Sewer Utilities locate

☐ Bacterial Testing (BAC-T) ☐ Flushing Waterlines

Project Name: {INSERT PROJECT NAME}

Project Number: {INSERT PROJECT #}

Company Requesting Assistance: {INSERT CONTRACTOR NAME}

Company Contact Name: {INSERT CONTRACTOR CONTACT}

Company Telephone: {INSERT CONTACT PHONE #}

Company Fax: {INSERT CONTRACTOR FAX}

Type of Work: {INSERT CONTRACTOR WORK TYPE}

Location of Work: {INSERT ASSISTANCE LOCATION}

Nearest Cross Street: {INSERT NEAREST CROSS STREET}

Project Manager: {INSERT PROJECT MANAGER}

Project Manager Phone Number: {INSERT PM PHONE #}

DEPARTMENT OF PUBLIC WORKS USE ONLY

Received By: _____

Date Received: _____ Time Received: _____

END OF DOCUMENT

SECTION 01745

SITE RESTORATION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Restoration of site affected by the Work in public or private property, including pavement, esplanades, sidewalks, driveways, fences, lawns and landscaping.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for restoration of the Project site disturbed by utility construction operations is on a linear foot basis. Measurement will be as provided for corresponding utility in each Technical Specification section. No separate payment made for branch pipe, valves and, other associated work for utilities. Measurement for restoration with multiple utilities within the same right-of-way will be on a linear foot basis for only one (1) utility.

2. No separate payment made for facility or roadway projects. Include cost in the surface improvements associated with the facility or roadway construction.

3. Payment includes required site restoration within the right-of-way or easement regardless of size or type of pipe, method of construction, paved or unpaved areas or thickness and width of pavement.

4. No separate payment made for site restoration for service connections under this Section. Include cost in appropriate utility section.

5. Refer to Section 01270 Measurement and Payment for Unit Price procedures.

B. Total Stipulated Price (Lump Sum) Contracts.

1. If Contract is Total Stipulated Price Contract, include payment for work under this section in Total Stipulated Price.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01110 Scope of Work.

2. Section 01270 Measurement and Payment.

3. Section 01330 Submittal Procedures.

4. Section 01560 Tree and Plant Protection.

5. Section 01580 Waste Disposal.

6. Section 02455 Disinfection of Water Lines.

7. Section 02845 Pavement Repair and Resurfacing.

8. Section 02910 Hydromulch Seeding.

9. Section 02915 Sodding.

1.4 DEFINITIONS

A. Phase: Locations identified on the plans and listed in Section 01110 Summary of Work under Work Sequence.

B. Site Restoration: Replacement or reconstruction of Site Improvements located in rights-of-way, easements, public property, and private property affected or altered by the Work.

1. Disturbed areas outside easements, rights-of-way or other designation of the proposed Work Area shall be restored at the Contractors expense.

2. Temporary construction Easements or any other areas used for the benefit of the Contractor is incidental to the Work and shall be restored at no cost to the City.

C. Site Improvement: Includes pavement, curbs and gutters, esplanades, sidewalks, driveways, fences, lawns, irrigation systems, landscaping, and other improvements in existence at the Project site before commencement of construction operations.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 -Submittal Procedures.

B. Schedule of testing, service connections, abandonment, backfill, and site restoration.

C. Sample of notices to residents outlining their responsibility for maintenance of site improvements adjacent to the Project that are not disturbed by construction operations.

1.6 SCHEDULING

A. Schedule testing, service connections, abandonment, backfill and site restoration immediately following completion of pipe laying work or paving within each block or line segment.

B. Phased Construction:

1. Commencement of subsequent Phase will follow scheduling of site restoration of prior Phase. Limit work to a maximum of two (2) Phases of the project.

C. Construction of Projects with no Phases listed in Section 01110 Summary of Work:

1. Complete site restoration prior to disturbing over fifty percent (50%) of total project linear feet or two thousand linear feet (2000 Lf), whichever is greater, of right-of-way or easement.

2. Limit work to a maximum of fifty percent (50%) of total project linear feet or two thousand linear feet (2000 Lf), whichever is greater, of right-of-way and easement. Commence work in additional right-of-way or easement after completion of site restoration.

PART II: PRODUCTS

2.1 MATERIALS

A. Pavement, Sidewalks and Driveways: Materials specified in Section 02845 Pavement Repair and Resurfacing.

B. Seeding and Sodding: Sod specified in Section 02915 Sodding and Seed specified in Section 02910 Hydromulch Seeding.

C. Trees, Shrubs and Plantings: Conform to requirements of Section 01560 Tree and Plant Protection.

PART III: EXECUTION

3.1 Preparatory Work

A. Provide cleanup and restoration crews to work closely behind pipe laying and roadway construction crews, and where necessary, during testing, service restoration, abandonment, backfill and surface restoration.

B. Water Lines: Unless otherwise approved by the Project Manager, comply with the following:

1. Once the Project Manager approves work within a Phase, immediately begin preparatory work for disinfection effort.

2. No later than three days (3 D) after completing disinfection preparatory work, submit to City appropriate request for disinfection.

3. If City fails to perform initial disinfection of lines in accordance with Section 2455 Disinfection of Water Lines, within seven days (7 D) from submission of appropriate request, and if approved by the Project Manager, pipe laying operations may continue beyond approved limits until the City responds.

4. Immediately after transfer of services, begin abandonment of old water lines and site restoration.

C. Wastewater Lines:

1. Once the Project Manager approves work within a Line Segment, immediately begin preparatory work for testing effort.

2. No later than three days (3 D) after completing preparatory work for testing, initiate testing work.

3. Immediately after transfer of service connections, begin abandonment of old wastewater lines, and site restoration.

D. Street Construction and Paving Projects.

1. Once the Project Manager approves work within a block, immediately begin preparatory work for sidewalk construction, sodding and hydromulching and tree planting.

2. No later than seven days (7 D) after completing preparatory work, initiate construction.

3.2 CLEANING

A. Remove debris and trash to maintain a clean and orderly site in accordance with requirements of the General Conditions and Section 01580 Waste Material Disposal.

3.3 LANDSCAPING AND FENCES

A. Seeding and Sodding.

1. Remove construction debris and level area with bank sand so that new grass surface matches level of existing grass and maintains pre-construction drainage patterns. Level and fill minor ruts or depressions caused by construction operations with bank sand, where grass is still viable.

2. Restore previously existing turfed areas with sod and fertilize in accordance with Section 02915 Sodding. Sod to match existing turf.

3. Restore unpaved areas not requiring sodding with hydromulch seeding conforming to Section 02910 Hydromulch Seeding.

B. Trees, Shrubbery and Plants.

1. Remove and replant trees, shrubs, and plants in accordance with requirements of Section 01560 Tree and Plant Protection.

C. Fence Replacement.

1. Replace removed or damaged fencing to equal or better condition than existed prior to construction, including concrete footings and mow strips. Provide new wood posts, top and bottom railing and panels. Metal fencing material, not damaged by the Work, may be reused.

2. Remove and dispose of damaged or substandard material.

3.4 MAINTENANCE

A. Maintain shrubs, plantings, sodded areas and seeded areas.

B. Replace shrubs, plantings and seeded or sodded areas that fail to become established.

C. Refer to Section 01560 Tree and Plant Protection, Section 02915 Hydromulch Seeding and Section 02910 Sodding for maintenance requirements.

END OF SECTION

SECTION 02000

EROSION CONTROL SYSTEMS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for construction and maintenance of erosion and sedimentation systems control and their components.

B. Requirements for location and extent of the components of erosion and sedimentation systems.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No payment will be made for erosion control systems under this Section. Include cost in applicable erosion control measures.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

B. CFCO City of Friendswood Code of Ordinances.

C. EPA Environmental Protection Agency.

D. TCEQ Texas Commission on Environmental Quality.

PART II: PRODUCTS NOT USED

PART III: EXECUTION

3.1 GENERAL

A. No clearing and grubbing or rough cutting, other than as specifically directed by the Project Manager to allow soil testing and surveying, shall be permitted until erosion and sedimentation control systems are in place.

B. All equipment and vehicles used on the construction site shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way, easements or areas of construction.

C. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

D. Conduct all construction operation under this Contract in conformance with the erosion control practices described in this Technical Specification.

3.2 EROSION AND SEDIMENTATION CONTROL SYSTEMS REQUIRED FOR CONSTRUCTION OF WATER, SEWER AND DRAINAGE IMPROVEMENTS

A. Storm Sewers

1. Inlet protection barriers shall be constructed prior to commencing work, using either a non-woven geotextile filter fabric silt fence or a straw bale silt fence.

2. Inlet protection barriers shall be constructed prior to commencing work immediately around each completed or partially completed storm manhole or inlet.

3. Contractor shall not leave any storm manhole or inlet unprotected overnight.

B. Sanitary Sewers

1. Under no circumstances shall unfiltered runoff enter the existing sanitary sewer system during construction.

2. Water and sediment removed from any parts of a partially constructed or unaccepted sanitary sewer system shall not be discharged directly into the storm sewer system, unprotected swales or unprotected ditches.

3. Water and sediment shall be discharged into the storm sewer system upstream of inlet protection barriers.

C. Water Distribution System

1. Water used to blow off the system shall be directed to nearby inlets upstream of inlet protection barriers.

2. Water used to blow off the system shall not be directed to existing unprotected swales or unprotected ditches.

D. Place silt fences on downstream side of construction site when shown on the Drawings or when directed by the Project Manager.

E. Compact top layer of any stockpiled excavated material that is to be left on site overnight.

F. Trash pumps shall not discharge directly to any unprotected swale, unprotected ditch or unprotected low lying area.

G. Trash pumps shall discharge upstream of inlet protection barriers or silt fences.

H. The Contractor and the Project Manager shall inspect the erosion and sedimentation control system after each rain, daily during periods of prolonged rainfall and at a minimum of once a week regardless of weather.

I. When damage to sediment control system is discovered, the Contractor shall immediately repair and/or replace damaged components of the system.

J. The Contractor shall remove sediment deposits when the sediment has accumulated to one-half (1/2) the height of any area along any silt fence.

K. Cast and spread sediment deposits within the limits of the construction site as directed by the Project Manager.

3.3 EROSION AND SEDIMENTATION CONTROL SYSTEMS REQUIRED FOR CONSTRUCTION OF PAVING IMPROVEMENTS

A. Inlet protection barriers shall either be constructed by the paving contractor, or if inlet protection barriers are already in place, the paving contractor shall accept them for maintenance prior to commencing any

other construction activities.

B. Place silt fences on downstream side of construction site when shown on the Drawings or when directed by the Project Manager.

C. Compact top layer of any stockpiled excavated material that is to be left on site overnight.

D. Trash pumps shall not discharge directly to any unprotected swale, unprotected ditch or unprotected low-lying area.

E. Trash pumps shall discharge upstream of inlet protection barriers or silt fences.

F. Before concrete pavement is placed and curb is completed, all previously constructed inlet protection barriers may be adjusted by the paving contractor.

G. Storm manholes and inlets shall not be left overnight without inlet protection barriers before placement of concrete pavement and curb is completed.

H. After placement and curing of the concrete curb, silt fences shall be placed behind the curb.

I. Remove inlet protection barriers only after construction of the silt fences behind the curb or other protective measures are in place.

J. The Contractor shall not leave any portion of any street unprotected overnight.

K. The Contractor and the Project Manager shall inspect the erosion and sedimentation control system after each rain, daily during prolonged periods of rainfall and at a minimum of once a week regardless of the weather.

L. When damage to sediment control system is discovered, the Contractor shall immediately repair and/or replace damaged components of the system.

M. The Contractor shall remove sediment deposits when the sediment has accumulated to one-half (1/2) the height of any area along any silt fence.

N. Cast and spread sediment deposits within the limits of the construction site as directed by the Project Manager.

3.4 MAINTENANCE

A. The following applies only when a Storm Water Pollution Prevention Program (SWPPP) has been implemented by the Contractor:

1. Unless otherwise directed by the Project Manager, the Contractor shall be responsible for maintenance of the erosion and sedimentation control system until final acceptance of the or until the paving contractor receives notice to proceed.

2. The Project Manager shall walk through the project with the paving contractor and the Design Professional, and together the three (3) parties will observe each component of the erosion and sedimentation control system and agree that either:

   a. Each component in the system is acceptable and the paving contractor shall assume maintenance responsibilities or,

   b. List repairs the Contractor must make to each component that is not acceptable before the paving contractor shall assume maintenance responsibilities.

3. When the paving contractor receives notice to proceed, the Contractor is then responsible for maintaining the existing erosion and sedimentation control system provided that either:

   a. There are no repairs required by the Contractor or,

   b. Repairs to the system have been completed by the Contractor.

4. The paving contractor shall dispose of any component of the system constructed by the Contractor that is not reused in a manner consistent with the purpose of the system.

5. The paving contractor shall continue maintenance of the erosion and sedimentation control system after final acceptance by the City if so directed by the Project Manager and if included in the bid proposal and unit price description.

6. The paving contractor shall dispose of the system the Contractor has constructed, when so directed, by the Project Manager.

B. When a PPP has not been implemented by the WSD (Water, Sewer and/or Drainage) Contractor, the paving Contractor shall be responsible for constructing and maintaining all components required by the PPP.

3.5 DUST CONTROL

A. Control dust dispersed and movement on construction sites and roads to prevent exposure of soil surfaces, to reduce on and offsite damage, to prevent health hazards, and to improve traffic safety.

B. Control dust dispersal and movement by utilizing one or more of the following methods:

1. Mulches bound with chemical binders such as Curasol, Terratack, or equal.

2. Temporary vegetative cover.

3. Spray-on adhesives on mineral soils not under traffic loads.

4. Tillage to roughen surface and bring clods to the surface.

5. Sprinkling with water to keep top layer moist.

C. Dust control methods shall be implemented immediately whenever dust can be observed blowing on or off the project site.

END OF SECTION

SECTION 02005

FILTER FABRIC SILT FENCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for the installation, maintenance and removal of erosion and sedimentation control filter fabric silt fence utilized during construction and prior to the final development of the site.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for filter fabric silt fence shall be on a unit price basis. Unit price includes cost of filter fabric fence, staking poles, ditching, and reinforcing. Maintenance during construction and removal of fence are incidental to installation and there shall be no separate pay for these items.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM □ American Society for Testing and Materials.

1. ASTM D4491 □ Standard Test Methods for Water Permeability of Geotextiles by Permitivity.

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02000 □ Erosion Control Systems.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

PART II: PRODUCTS

2.1 MATERIALS

A. Material shall be Non-woven Geotextile Filter Fabric:

1. Composed of either:

   a. Polypropylene material;

   b. Polyethylene material;

   c. Ethylene material;

   d. or Polyamide material.

2. Grab strength shall be at least one hundred pounds (100 Lbs) in any principal direction.

3. Mullen burst strength shall exceed two hundred pounds per square inch (200 psi).

4. Equivalent opening size shall be between fifty gallons per minute per square foot (50 gpm/Sf) and one hundred forty gallons per minute per square foot (140 gpm/Sf).

5. Water flow rate shall be ten gallons per minute per square foot (10 gpm/Sf) at fifty millimeters (50 mm) constant head as determined by multiplying permitivity (in sec^{-1}) as determined by ASTM D4491 by a conversion factor of seventy-four (74).

6. Ultraviolet ray inhibitors and stabilizers shall provide a maximum of six months (6 Mos) of expected usable life at a temperature range of zero degrees Fahrenheit (0° F) to one hundred twenty degrees Fahrenheit (120° F).

7. Ultraviolet radiation stability shall be ninety percent (90%).

8. Fabric reinforced with support netting shall be reinforced with an industrial polypropylene netting with three-quarter inch (3/4 In) spacing and shall also include a heavy duty nylon top support cord.

B. Fence Supports

1. Two inch by two inch (2 In x 2 In) wooden posts three feet (3 Ft) long or equivalent, and field constructed or;

2. Factory pre-assembled with support netting and heavy duty nylon top support cord.

PART III: EXECUTION

3.1 GENERAL

A. Except as otherwise directed or otherwise shown on the Drawings, provide non-woven geotextile filter fabric silt fences to prevent erosion and control sedimentation.

B. Maintain silt fences until the project is accepted by the City.

C. At the City's option, silt fences may remain in place after acceptance.

D. Maintenance and removal of silt fences shall comply with all requirements as specified in Section 02000 Erosion Control Systems.

3.2 CONSTRUCTION METHODS

A. Silt fences shall not exceed twenty-four inches (24 In) in height.

B. Wood posts shall be driven at least twelve inches (12 In) into the ground.

C. Maximum spacing of wood posts shall be three feet (3 Ft) for field constructed fences and eight feet (8 Ft) for factory pre-assembled silt fences.

D. Filter fabric shall be stapled using at least one-half inch (1/2 In) staples to the upslope side of the posts.

E. Anchor the filter fabric by spreading at least eight inches (8 In) of the fabric in a four inch by four inch (4 In x 4 In) trench or a four inch (4 In) deep V-trench on the upslope side of the fence.

END OF SECTION

SECTION 02010

STRAW BALE FENCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for the installation of erosion and sedimentation control straw bale fences utilized during construction and prior to the final development of the site.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for straw bale fence shall be on a unit price basis. Unit price includes cost of straw bale fence, staking poles, ditching, and reinforcing. Maintenance during construction and removal of fence are incidental to installation and there shall be no separate pay for these items.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02000 □ Erosion Control Systems.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

PART II: PRODUCTS

2.1 STRAW BALES

A. Use straw bales bound by either wire, nylon or poly-propylene rope tied across the straw bales.

B. Do not use straw bales bound with jute, cotton rope or twine.

2.2 ANCHOR STAKES

A. Bales shall be anchored using three-eighths inch (3/8 In) diameter reinforcing steel bars.

B. Length of bar shall be thickness of straw bale plus two feet (2 Ft).

PART III: EXECUTION

3.1 GENERAL

A. Except if otherwise directed or otherwise shown on the Drawings provide straw bale fences to prevent erosion and control sedimentation.

B. Maintain straw bale fences until the project is accepted by the City.

C. At City's option, straw bale fences may remain in place after acceptance.

D. Maintenance and removal of straw bale fences shall comply with all requirements as specified in Section 02000 – Erosion Control Systems.

3.2 CONSTRUCTION METHODS

A. Excavate four inches (4 In) of material to embed each straw bale in the soil.

B. Anchor bales securely by driving anchor stakes through the bales and at least two feet (2 Ft) into the ground below the bale.

C. The first (1st) stake in each bale shall be angled toward the previously laid bale to force bales together.

D. Fill any gaps between bales with straw to prevent unfiltered runoff from escaping between the bales.

E. Wedge straw in gaps carefully so as not to separate bales.

END OF SECTION

SECTION 02015

GEOTEXTILE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Geotextile, also called filter fabric, in applications including pipe embedment wrap, around exterior of tunnel liner, around foundations of pipeline structures and slope stabilization.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for work performed under this Section. Include cost of work in unit prices for work requiring geotextile.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO American Association of State Highway and Transportation Officials.

1. AASHTO M288 Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM American Society for Testing and Materials.

1. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

2. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

3. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles (Grab Method).

4. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of Geotextiles.

5. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02000 Erosion Control Systems.

4. Section 02125 Excavation and Backfill for Utilities.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit standard manufacturer s catalog sheets and other pertinent information, for approval, prior to installation.

C. Submit installation methods, as part of work plan for tunneling or for excavation and backfill for utilities. Obtain approval from the Project Manager for filter fabric material and proposed installation method prior to use of filter fabric.

PART II: PRODUCTS

2.1 GEOTEXTILE

A. Provide geotextile (filter fabric) designed for use in geotechnical applications. Filter fabric shall provide permeable layer or media while retaining soil matrix.

B. Use fabric which meets physical requirements for Class A subsurface drainage installation conditions as defined in AASHTO M288 and as specified in Paragraph 2.2, Properties.

2.2 PROPERTIES

A. Material: Nonwoven, nonbiodegradable, fabric consisting of continuous chain polymer filaments or yarns, at least eighty-five percent (85%) by weight polyolefins, polyesters or polyamide, formed into dimensionally

stable network.

B. Chemical Resistance: Inert to commonly encountered chemicals and hydrocarbons over pH range of three (3) to twelve (12).

C. Physical Resistance: Resistant to mildew and rot, ultraviolet light exposure, insects and rodents.

D. Minimum Test Values shall be as specified in TABLE 4.1 MINIMUM TEST VALUES FOR GEOTEXTILE MATERIAL in this section.

PART III: EXECUTION

3.1 GENERAL

A. Maintain geotextiles until the project is accepted by the City.

B. At City's option, geotextiles may remain in place after acceptance.

C. Maintenance and removal of geotextiles shall comply with all requirements as specified in Section 02000 Erosion Control Systems.

3.2 LINE WORK

A. Conform use of geotextile to backfill for utilities to Section 02125 Excavation and Backfill for Utilities.

PART IV: TABLES

4.1 MINIMUM TEST VALUES FOR GEOTEXTILE MATERIAL

PROPERTY	VALUE (MIN.)	TEST METHOD
Grab Strength	180 lbs.	ASTM D4632
Trapezodial Tear Strength	50 lbs.	ASTM D4533
Puncture Strength	80 lbs.	ASTM D4833
Mullen Burst Strength	290 psi.	ASTM D3786
Apparent Opening Size (1)	0.25 mm	ASTM D4751
Permittivity (sec^{-1})	0.2	ASTM D4491

(1) Maximum average roll value.

END OF SECTION

SECTION 02020

STABILIZED CONSRUCTION ACCESS, ROADS, PARKING AND WASH AREAS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Section includes requirements for construction, maintenance and removal of stabilized construction access.

B. Section includes requirements for construction, maintenance and removal of temporary stabilized roads, parking lots and wash areas.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for stabilized construction access shall be on a unit price basis for each installation.

2. Payment for temporary roads and driveways shall be on a unit basis per installation.

3. No separate measurement and payment shall be made for temporary parking lots or wash areas.

4. No separate measurement and payment shall be made for maintenance or removal or operations listed in this Section.

5. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 - Submittal Procedures.

3. Section 01580 Waste Material Disposal.

4. Section 02000 Erosion Control Systems.

5. Section 02015 Geotextile.

B. EPA Environmental Protection Agency.

C. TCEQ Texas Commission on Environmental Quality.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

PART II: PRODUCTS

A. Permeable separator shall be a geotextile conforming to Section 02015 Geotextile.

B. Construction access foundation shall be flexible base, bituminous concrete, cement stabilized base course, portland cement concrete or other material as approved by the Project Manager.

C. When wood construction entrance/exit is specified in the Drawings they shall conform to the following:

1. Cross timbers surface shall be treated six inch by six inch (6 In x 6 In) railroad ties a minimum of twenty foot (20 Ft) in length.

2. Bracing timber planks shall be two inch by ten inch (2 In x 10 In) treated, #2 grade minimum.

PART III: EXECUTION

3.1 GENERAL

A. Provide stabilized access, washing areas and/or parking areas at locations shown on the Drawings or as approved by the Project Manager.

B. Stabilized construction access:

1. Shall be placed to allow positive drainage from the access to an approved sediment control system.

2. Shall be a minimum of fifty feet (50 Ft) in length.

3. Shall have six to one (6:1) approaches on front and back slopes of access containing permeable separator and three inch (3 In) to five inch (5 In) rock with a minimum thickness of eight inches (8 In).

C. Roads and parking areas shall be graded to provide sufficient drainage away from stabilized areas.

1. Furnish and place geotextile fabric as a permeable separator to prevent mixing of granular fill with underlying soil.

2. Place one inch (1 In) to five inch (5 In) granular fill to dimensions and depths shown on the Drawings or as directed by the Project Manager. The minimum thickness shall be eight inches (8 In).

3. Use sandbags, gravel, boards or similar methods to prevent sediment from entering public rights-of-way, storm drains, ditches and watercourses.

D. Wash areas shall be graded to provide sufficient drainage away from stabilized areas.

1. Furnish and place geotextile fabric as a permeable separator to prevent mixing of granular fill with underlying soil.

2. Place one inch (1 In) to five inch (5 In) granular fill to dimensions and depths shown on the Drawings or as directed by the Project Manager. The minimum thickness shall be eight inches (8 In).

3. Use sandbags, gravel, boards or similar methods to prevent sediment from entering public rights-of-way, storm drains, ditches and watercourses.

3.2 MAINTENANCE

A. Inspect and maintain stabilized areas daily. Provide periodic top dressing with additional granular fill as necessary.

B. Repair or replace components of stabilized access areas that become defective from intended use.

C. Maintain stabilized access areas as specified in Section 02000 □

Erosion Control Systems until acceptance of the Project or as directed by the Project Manager.

D. Remove stabilized access as specified in Section 02000 □ Erosion Control Systems promptly when directed by the Project Manager. Restore areas where stabilized construction access was removed to final project grade in preparation of turf establishment by others.

3.3 DISPOSAL

A. Remove all waste and sediment material from project conforming with requirements specified in Section 01580 □ Waste Material Disposal.

END OF SECTION

SECTION 02025

SANDBAG BARRIERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for the installation of erosion and sedimentation control installation of erosion and sedimentation control of sandbag barriers, which shall be utilized prior to the final development of the site and during construction.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for sandbag barrier shall include and be full compensation for all labor, equipment, materials, supervision, and all incidental expenses for construction of these items, complete in place, including, but not limited to, protection of trees, maintenance requirements, repair and replacement of damaged sections, removal of sediment deposits, and removal of erosion and sedimentation control systems at the end of construction.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01560 □ Tree and Plant Protection.

4. Section 02000 □ Erosion Controls Systems.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

PART II: PRODUCTS

2.1 SANDBAG MATERIAL

A. Provide woven sandbag material made of polypropylene, polyethylene, or polyamide material. Sandbag material shall have a minimum unit weight of four ounces per square yard (4 Oz/Sy), minimum grab strength of one hundred pounds per square inch (100 psi) in any principal direction (ASTM D4632), Mullen burst strength exceeding three hundred pounds per square inch (300 psi) (ASTM D3786), and ultraviolet stability exceeding seventy percent (70%).

2.2 SANDBAG

A. Provide sandbag with length approximately eighteen inches (18 In) to twenty-four inches (24 In), width twelve inches (12 In) to eighteen (18 In) inches, and thickness six inches (6 In) to eight inches (8 In). Weight fifty pounds (50 Lbs) to one hundred twenty-five pounds (125 Lbs).

PART III: EXECUTION

3.1 GENERAL

A. Except as otherwise directed or otherwise shown on the Drawings, provide non-woven geotextile filter fabric sandbags to prevent erosion and control sedimentation.

B. Maintain sandbags until the project is accepted by the City.

C. At The City s option, sandbags may remain in place after acceptance.

D. Maintenance and removal of sandbags shall comply with all requirements as specified in Section 02000 Erosion Control Systems.

3.2 CONSTRUCTION METHODS

A. Provide sandbag barriers at locations specified on the Drawings. Sandbag barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.

B. Inspect sandbag barrier systems after each rainfall, daily during periods of prolonged rainfall and at a minimum once a week regardless of weather. Repair or replace damaged section immediately to restore the requirements of this Item. Remove sediment deposits when silt reaches one-third of the height of the sandbag in depth.

END OF SECTION

SECTION 02030

ROCK FILTER DAMS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Section includes requirements for furnishing, installing, maintaining and removing rock filter dams.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Measurement and payment is as noted on the Unit Price Schedule.

2. Refer to Section 01270 – Measurement and Payment for unit price procedures.

3. Geotextile, excavation and disposal, granular fill and reinforcing wire shall not be measured separately.

4. No separate payment shall be made for removal of accumulated sediment. Maintenance and removal and subsequent reinstallation, if required, of the rock filter dam shall be incidental to the cost of the rock filter dam.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM – American Society for Testing and Materials.

1. ASTM A975 – Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Polyvinyl Chloride (PVC) Coating).

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01580 – Waste Material Disposal.

4. Section 02000 – Erosion Control Systems.

5. Section 02015 – Geotextile.

6. Section 02900 – Turf Establishment.

1.4 SUBMITTALS

A. Refer to Section 01330 – Submittal Procedures.

B. Submit catalog data and mill certificate for geotextile and catalog data for wire to be used.

PART II: PRODUCTS

2.1 GRANULAR FILL

A. Provide granular fill consisting of concrete or stone. Provide granular fill that is dense, durable and hard material.

B. Provide granular fill, as shown on the Drawings or as directed by the Project Manager, to the following dimensions:

1. Provide three inch (3 In) to five inch (5 In) granular fill with no material diameter less than three inches (3 In) and no material diameter greater than five inches (5 In).

2.2 WIRE COATING

A. Style 1 – zinc coated prior to being double twisted into mesh in accordance with ASTM A975.

2.3 WIRE MESH FOR REINFORCEMENT

A. Provide twenty (20) gauge galvanized double-twisted hexagonal wire mesh and tie wires or as shown on the Construction Plans.

2.4 CONNECTION WIRES AND STIFFENERS

A. Provide spiral binders, lacing wire and stiffeners made of wire having the same coating material and same wire size as the wire mesh for reinforcement.

2.5 GEOTEXTILE SEPARATION FABRIC

A. Provide a geotextile of woven or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least ninety-five percent (95%) by weight of polyolefins. Provide geotextile fabric equal as specified in TABLE 4.1 – MINIMUM AVERAGE ROLL VALUE and TABLE 4.2 – MAXIMUM AVERAGE ROLL VALUE in this section.

B. Refer to Section 02015 – Geotextile for storage and handling precautions and requirements.

PART III: EXECUTION

3.1 GENERAL

A. Except as otherwise directed or otherwise shown on the Drawings, provide non-woven geotextile filter fabric rock filter dams to prevent erosion and control sedimentation.

B. Maintain rock filter dams until the project is accepted by the City.

C. At the City's option, rock filter dams may remain in place after acceptance.

D. Maintenance and removal of rock filter dams shall comply with all requirements as specified in Section 02000 – Erosion Control Systems.

3.2 SEDIMENT DISPOSAL

A. Refer to Section 01580 – Waste Material Disposal.

PART IV: TABLES

4.1 MINIMUM AVERAGE ROLL VALUE

MINIMUM AVERAGE ROLL VALUE	
Elongation	< 50 percent
Grab Strength	≥ 200 pounds
Puncture Strength	≥ 75 pounds
UV Stability (retained strength)	≥ 50 percent[1]

[1]After five hundred hours (500 Hrs) of exposure.

4.2 MAXIMUM AVERAGE ROLL VALUE

MAXIMUM AVERAGE ROLL VALUE	
Apparent Opening Size	0.212 to 0.6 mm[1]

[1]#70 to #30 US sieve.

END OF SECTION

SECTION 02100

CLEARING AND GRUBBING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Removing surface debris and rubbish.

B. Clearing site of plant life and grass.

C. Removing trees and shrubs.

D. Removing root system of trees and shrubs.

E. Fence removal.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for clearing and grubbing shall be on a per acre basis.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate clearing work with utility companies.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01580 Waste Material Disposal.

PART II: PRODUCTS Not Used

PART III: EXECUTION

3.1 PREPARATION

A. Verify that existing plant life and features designated to remain are identified and tagged.

3.2 PROTECTION

A. Protect following from damage or displacement:

1. Living trees located three feet (3 Ft) or more outside of intersection of side slopes and original ground line.

2. Plants and landscape features designated to remain.

3. Utilities designated to remain.

4. Bench marks, monuments and existing structures designated to remain.

3.3 CLEARING

A. Remove stumps, main root ball and root system to:

1. Depth of twenty-four inches (24 In) below finished subgrade elevation in area bounded by lines two feet (2 Ft) behind back of curbs.

2. Depth of twenty-four inches (24 In) below finished surface of required cross section for other areas.

B. Clear undergrowth and deadwood without disturbing subsoil.

C. Remove vegetation from top soil scheduled for reuse.

3.4 REMOVAL

A. Remove debris, rubbish and extracted plant material from site in accordance with requirements of Section 01580 Waste Material Disposal.

B. Remove on-site fences: Materials generated from removal of fences shall become property of the Contractor. Properly dispose of materials in accordance with applicable local, state and federal laws, or as otherwise directed by the Project Manager.

END OF SECTION

SECTION 02105

REMOVING EXISTING PAVEMENTS AND STRUCTURES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Removing concrete paving, asphaltic concrete pavement, brick pavement and base courses.

B. Removing concrete curbs, concrete curbs and gutters, sidewalks and driveways.

C. Removing pipe culverts, sewers and sewer leads.

D. Removing existing inlets and manholes.

E. Removing and disposing of concrete beams, including pre-stressed beams, and drill shafts.

F. Removing miscellaneous structures constructed of concrete or masonry.

G. Removing existing bridges.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for removing and disposing of asphaltic surfacing with or without base, regardless of thickness encountered, shall be on a square yard basis measured between lips of gutters.

2. Payment for removing and disposing of reinforced concrete pavement, with or without asphalt overlay, regardless of thickness encountered, shall be on a square yard basis measured from back-to-back of curbs. Payment includes concrete pavement, esplanade curbs, curbs and gutters and paving headers.

3. Payment for removing and disposing of cement stabilized shell base course, with or without asphaltic surfacing, regardless of thickness encountered, shall be on a square yard basis.

4. Payment for removing and disposing of concrete sidewalks and driveways, regardless of thickness encountered, shall be on a square yard basis.

5. Payment for removing asphaltic surface course, regardless of thickness encountered, shall be on a square yard basis paid under item description "Asphalt Surface Mill." This includes removal of existing surface to pavement base.

6. Payment for removing and disposing of miscellaneous concrete and masonry items shall be on a cubic yard basis of structure in place.

7. Payment for removing and disposing of pipes, culverts, sewers and sewer leads shall be on a linear foot basis for each diameter and each material type of pipe removed.

8. Payment for removing and disposing of existing inlets shall be on unit a price basis for each inlet removed.

9. Payment for removing and disposing of concrete piles, including pre-stressed piles, and drill shafts shall be on a linear foot basis.

10. Payment for removing and disposing of existing bridges, including piles and abutments to minimum of four feet (4 Ft) below ground level, shall be on a lump sum basis.

11. Payment for removing and disposing of existing manholes shall be on a unit price basis for each manhole removed.

12. No payment for saw cutting of pavement, curbs or curbs and gutters will be made under this section. Include cost of such work in unit prices for items requiring saw cutting which are listed on the Unit Price Form.

13. No payment will be made for work outside maximum payment limits indicated on the Drawings or for pavements, structures or other items removed for the Contractor's convenience.

    a. For utility installations: Actual pavement replaced should match but not be greater than maximum pavement replacement limits shown on the Drawings. Limits of measurement will be as shown on Street Cut Pavement Replacement Rules.

14. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract shall be Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate removal work with utility companies.

1.4 REFERENCES

A. CTFS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01580 Waste Material Disposal.

3. Section 02120 Excavation and Backfill for Structures.

PART II: PRODUCTS Not Used

PART III: EXECUTION

3.1 PREPARATION

A. Obtain advance approval from the Project Manager for dimensions and limits of pavement, structures and other items to be removed.

B. Identify known utilities below grade. Stake and flag locations.

3.2 PROTECTION

A. Protect the following from damage or displacement:

1. Adjacent public and private property.

2. Trees, plants and other landscape features designated to remain.

3. Utilities designated to remain.

4. Pavement, structures and other items designated to remain.

5. Bench marks, monuments and other items designated to remain.

3.3 REMOVALS

A. Remove pavements, structures and other items by methods that will not damage underground utilities. Do not use drop hammer near existing underground utilities.

B. Minimize amount of earth loaded during removal operations.

C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to minimum depth of two inches (2 In).

D. When street and driveway saw cut location is greater than one-half (1/2) of pavement lane width, remove pavement for full lane width or to nearest longitudinal joint as directed by the Project Manager.

E. Remove sidewalks and curbs to nearest existing dummy, expansion or construction joint.

F. Where existing end of pipe culvert or end of sewer is to remain, install eight inch (8 In) thick masonry plug in pipe end prior to backfill in accordance with requirements of Section 02120 Excavation and Backfill for Structures.

3.4 BACKFILL

A. Backfill of areas excavated during removal operations shall be in accordance with requirements of Section 02120 Excavation and Backfill for Structures.

3.5 DISPOSAL

A. Inlet frames, grates and plates; and manhole frames and covers may, as directed, remain City property. Disposal shall be in accordance with requirements of Section 01580 Waste Material Disposal.

B. Remove from site any debris resulting from work under this section in accordance with requirements of Section 01580 Waste Material

Disposal.

END OF SECTION

SECTION 02110

BORROW

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Soil materials for embankment.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for borrow shall be on a cubic yard basis calculated by theoretical quantities using average end area method based on the Drawings.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials

1. ASTM D2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures.

2. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 01555 Traffic Control and Regulation.

6. Section 02115 Embankment.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit location and description of proposed borrow area for approval.

C. Submit material samples for testing.

PART II: PRODUCTS

2.1 SOIL MATERIAL

A. Borrow material to be used for embankment shall be free of lumps greater than six inches (6 In), rocks larger than three inches (3 In), organic material, chemical waste or other contamination and debris. Take borrow material from sources approved by the Project Manager.

B. Material shall have a plasticity index not less than twelve (12), nor more than twenty (20) when tested in accordance with ASTM D4318. Maximum liquid limit shall be forty-five (45), unless approved by the Project Manager. Blending of cohesive and granular soils to achieve required plasticity index is not allowed.

PART III: EXECUTION

3.1 PREPARATION

A. Notify the Project Manager and testing laboratory five days (5 D) in advance of opening borrow source to permit obtaining samples for qualification testing. If material does not meet specification requirements, locate another source of borrow.

B. Clear approved source area of trees, stumps, brush, roots, vegetation organic matter and other unacceptable material before excavation.

3.2 TESTS

A. Test and analyze soil materials in accordance with ASTM D4318 and

ASTM D2216 under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

3.3 EXCAVATION

A. Provide adequate drainage of surface water so that surface water run off does not enter borrow pit excavation.

3.4 HAULING

A. Use covered trucks to transport material to site of embankment construction. Conform to requirements of Section 01555 Traffic Control and Regulation.

END OF SECTION

SECTION 02115

EMBANKMENT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Construction of embankments with qualified excess excavated material and borrow material.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for borrow material and handling under this section. Include payment in unit price for excavation or borrow.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft_3 (600 kN-m/m_3)).

2. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

3. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 01580 Waste Material Disposal.

6. Section 02110 Borrow.

7. Section 02120 Excavation and Backfill for Structures.

8. Section 02125 Excavation and Backfill for Utilities.

9. Section 02135 Excavation for Roadway.

10. Section 02140 Utility Backfill Materials.

11. Section 02400 Water Lines.

12. Section 02500 Gravity Sanitary Sewers.

13. Section 02510 Sanitary Sewer Force Mains.

C. TCEQ Texas Commission on Environmental Quality.

D. TDSHS Texas Department of State Health Services.

E. TRRC Texas Railroad Commission.

PART II: PRODUCTS

2.1 MATERIALS

A. Refer to Section 02135 Excavation For Roadway, for acceptable excess materials from roadway excavation.

B. Refer to Section 02125 Excavation and Backfill For Utilities, for acceptable excess materials from utility excavation and trenching.

C. Refer to Section 02110 Borrow, for acceptable borrow materials.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify that borrow and excess excavated materials to be reused are approved.

B. Verify that removal and clearing and grubbing operations have been completed.

3.2 PREPARATION

A. Backfill test pits, stump holes, small swales and other surface irregularities. Backfill and compact in designated lift depths to requirements for embankment compaction.

B. Record location and plug and fill inactive water and oil wells. Conform to Texas Department of State Health Services (TDSHS), Texas Commission on Environmental Quality (TCEQ) and Texas Railroad Commission (TRRC) requirements. Notify the Project Manager prior to plugging wells.

C. Excavate and dispose of unsuitable soil and other unsuitable materials which will not consolidate. Backfill and compact to requirements for embankment. Unsuitable soil is defined in Section 02120 Excavation and Backfill for Structures and Section 02140 Utility Backfill Materials.

D. Backfill new utilities below future grade. Conform to requirements of Sections 02125 Excavation and Backfill For Utilities, 02400 Water Lines, 02500 Gravity Sanitary Sewers and 02510 Sanitary Sewer Force Mains.

3.3 PROTECTION

A. Protect trees, shrubs, lawns, existing structures and other features outside of embankment limits.

B. Protect utilities above and below grade, which are to remain.

C. Conform to protection requirements of Section 02135 Excavation For Roadway.

3.4 PLACING EMBANKMENT

A. Do not conduct placement operations during inclement weather or

when existing ground or fill materials exceed three percent (3%) above optimum moisture content. The Contractor may manipulate wet material to facilitate drying by disking or windrowing.

B. Do not place embankment fill until density and moisture content of previously placed material complies with specified requirements.

C. Scarify areas to be filled to minimum depth of four inches (4 In) to bond existing and new materials. Mix with first (1st) fill layer.

D. Spread fill material evenly, from dumped piles or windrows, into horizontal layers approximately parallel to finished grade. Place proper thickness to meet specified compacted thickness. Break clods and lumps and mix materials by blading, harrowing, disking or other approved method. Extend each layer across full width of fill.

E. Each layer shall be homogeneous and contain uniform moisture content before compaction. Mix dissimilar abutting materials to prevent abrupt changes in composition of fill.

F. Layers shall not exceed the following compacted thickness:

1. Areas indicated to be under future paving or shoulders, to be constructed within six months (6 Mos): six inches (6 In) when compacted with pneumatic rollers or eight inches (8 In) when compacted with other rollers.

2. Other areas: Twelve inches (12 In).

G. For steep slopes, cut benches into slope and scarify before placing fill. Place increasingly wider horizontal layers of specified depth to level of each bench.

H. Build embankment layers on back slopes, adjacent to existing roadbeds, to level of old roadbed. Scarify top of old roadbed to minimum depth of four inches (4 In) and recompact with next fill layer.

I. Construct to lines and grades shown on the Drawings.

J. Remove unsuitable material and excess soil not being used for embankment from site in accordance with requirements of Section 01580 Waste Material Disposal.

K. Maintain moisture content of embankment materials to attain required density.

L. Compact to following minimum densities at moisture content of optimum to three percent (3%) above optimum as determined by ASTM D698, unless otherwise indicated on the Drawings:

1. Areas under future paving and shoulders: Minimum density of ninety-five percent (95%) of maximum dry density.

2. Other areas: Minimum density of ninety percent (90%) of maximum dry density.

3.6 TOLERANCES

A. Top of compacted surface: Plus or minus one-half inch (±1/2 In) in cross section or in sixteen feet (16 Ft) longitudinally.

3.7 FIELD QUALITY CONTROL

A. Compaction Testing shall be performed in accordance with ASTM D698 or ASTM D2922 and ASTM D3017 under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. A minimum of three (3) tests shall be taken for each one thousand linear feet (1000 Lf) per lane of roadway or five hundred square yards (500 Sy) of embankment per lift at random locations determined by the Project Manager.

C. If tests indicate work does not meet specified compaction requirements, recondition, recompact and retest at no cost to the City.

END OF SECTION

SECTION 02120

EXCAVATION AND BACKFILL FOR STRUCTURES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Excavation, backfilling and compaction of backfill for structures

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for structural excavation and backfill under this Section. Include payment in unit price or lump sum for construction of structures.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 DEFINITIONS

A. Unsuitable Material

1. Unsuitable soil materials are the following:

a. Materials that are classified as ML, CL-ML, MH, PT, OH and OL according to ASTM D2487.

b. Materials that cannot be compacted to required density due to gradation, plasticity or moisture content.

c. Materials that contain large clods, aggregates, stones greater than four inches (4 In) in any dimension, debris, vegetation, waste or any other deleterious materials.

d. Materials that are contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material: Suitable soil materials are those meeting specification requirements. Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement shall be considered suitable, unless otherwise indicated.

C. Select Material: Material as defined in Section 02140 Utility Backfill Materials.

D. Backfill: Select material meeting specified quality requirements, placed and compacted under controlled conditions around structures.

E. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill where needed to provide stable support for structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

F. Foundation Base: For foundation base material, use crushed stone aggregate with filter fabric as required, cement-stabilized sand or concrete seal slab. Foundation base provides smooth, level working surface for construction of concrete foundation.

G. Foundation Subgrade: Foundation subgrade is surface of natural soil which has been excavated and prepared to support foundation base or foundation backfill, where needed.

H. Ground Water Control Systems: Installations external to excavation such as well points, eductors or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of excavation and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01585 Control of Ground and Surface Water.

I. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from excavation. Remove rain water and surface water which accidentally enters excavation as part of excavation drainage.

J. Excavation Drainage: Removal of surface and seepage water in excavation by sump pumping and using French drains surrounding foundation to intercept water.

K. Over-Excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable

materials below foundation as shown on the Drawings and backfilled with foundation backfill material.

L. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins.

1.4 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D698 Standard Test Methods for Laboratory Compaction of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600kN-m/m3)).

2. ASTM D1556 Standard Test Method for Density of Soil in Place by Sand-Cone Method.

3. ASTM D2922 Standard Test Methods for Density of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

4. ASTM D3017 Standard Test Method for Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depths).

5. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 01555 Traffic Control and Regulation.

6. Section 01560 Tree and Plant Protection.

7. Section 01580 Waste Material Disposal.

8. Section 01585 Control of Ground and Surface Water.

9. Section 01785 Project Record Documents.

10. Section 02015 Geotextile .

11. Section 02105 Removing Existing Pavements and Structures.

12. Section 02110 Borrow.

13. Section 02140 Utility Backfill Materials.

14. Section 02145 Cement-Stabilized Sand.

15. Section 02280 Trench Safety System.

C. TxDOT Texas Department of Transportation.

1. TxDOT Tex-101-E Preparing Soil and Flexible Base Materials for Testing.

2. TxDOT Tex-110-E Particle Size Analysis of Soils.

D. OSHA Occupational Safety and Health Administration.

1. Federal Regulations, 29 CFR, Part 1926, Standards Excavation, Occupational Safety and Health Administration (OSHA).

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit work plan for excavation and backfill for each structure with complete written description which identifies details of proposed method of construction and sequence of operations for construction relative to excavation and backfill activities. Use descriptions, with supporting illustrations, sufficiently detailed to demonstrate to the Project Manager that procedures meet requirements of the Technical Specifications and the Drawings.

C. Submit excavation safety system plan.

1. Submit excavation safety system plan in accordance with applicable OSHA requirements for excavations.

2. Submit excavation safety system plan in accordance with requirements of Section 02280 Trench Safety Systems, for excavations that fall under State and Federal trench safety

laws.

D. Submit ground and surface water control plan in accordance with requirements in this Section and Section 01585 Control of Ground and Surface Water.

E. Submit backfill material sources and product quality information in accordance with requirements of Section 02140 Utility Backfill Materials.

F. Submit project record documents under provisions of Section 01785 Project Record Documents. Record location of utilities, as installed, referenced to survey benchmarks. Include location of utilities encountered or rerouted. Give horizontal dimensions, elevations, inverts and gradients.

1.6 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by the City in accordance with requirements of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures and as specified in this Section.

B. Perform embedment and backfill material source qualification testing in accordance with requirements of Section 02140 Utility Backfill Materials.

PART II: PRODUCTS

2.1 EQUIPMENT

A. Perform excavation with equipment suitable for achieving requirements of this Specification.

B. Use equipment which will produce degree of compaction specified. Compact backfill within three feet (3 Ft) of walls with hand operated equipment. Do not use equipment weighing more than ten thousand pounds (10000) closer to walls than a horizontal distance equal to depth of fill at that time. Use hand operated power compaction equipment where use of heavier equipment is impractical or restricted due to weight limitations.

2.2 MATERIAL CLASSIFICATIONS

A. Use backfill materials conforming to classifications and product descriptions of Section 02140 Utility Backfill Materials. Use classification or product description for backfill applications as shown on the Drawings and as specified.

PART III: EXECUTION

3.1 PREPARATION

A. Conduct an inspection to determine condition of existing structures and other permanent installations.

B. Set up necessary street detours and barricades in preparation for excavation if construction will affect traffic. Conform to requirements of Section 01555 Traffic Control and Regulation. Maintain barricades and warning devices at all times for streets and intersections where work is in progress or where affected by the Work and such is considered hazardous to traffic movements.

C. Perform work in accordance with OSHA standards. Employ an excavation safety system as specified in Section 02280 Trench Safety Systems.

D. Remove existing pavements and structures, including sidewalks and driveways, in accordance with requirements of Section 02105 Removing Existing Pavements and Structures.

E. Install and operate necessary dewatering and surface water control measures in accordance with requirements of Section 01585 Control of Ground and Surface Water.

3.2 PROTECTION

A. Protect trees, shrubs, lawns, existing structures and other permanent objects outside of grading limits and within grading limits as designated on the Drawings and in accordance with requirements of Section 01560 Tree and Plant Protection.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on the

Drawings.

D. Prevent erosion of excavations and backfill. Do not allow water to pond in excavations.

E. Maintain excavation and backfill areas until start of subsequent work. Repair and recompact slides, washouts, settlements or areas with loss of density at no additional cost to the City.

3.3 EXCAVATION

A. Perform excavation work so that underground structures can be installed to depths and alignments shown on the Drawings. Use caution during excavation work to avoid disturbing surrounding ground and existing facilities and improvements. Keep excavation to the absolute minimum necessary. No additional payment will be made for excess excavation not authorized by the Project Manager.

B. Upon discovery of unknown utilities, badly deteriorated utilities, utilities not designated for removal or concealed conditions, discontinue work at that location. Notify the Project Manager and obtain instructions before proceeding in such areas.

C. Immediately notify agency or company owning any line which is damaged, broken or disturbed. Obtain approval from the Project Manager and agency for any repairs or relocations, whether temporary or permanent.

D. Avoid settlement of surrounding soil due to equipment operations, excavation procedures, vibration, dewatering or other construction methods.

E. Provide surface drainage during construction to protect work and to avoid nuisance to adjoining property. Where required, provide proper dewatering and piezometric pressure control during construction.

F. Conduct hauling operations so that trucks and other vehicles do not create dirt nuisance in streets. Verify that truck beds are sufficiently tight and loaded in such a manner such that objectionable materials will not spill onto streets. Promptly clear away any dirt, mud or other materials that spill onto streets or are deposited onto streets by vehicle tires.

G. Maintain permanent benchmarks, monumentation and other reference points. Unless otherwise directed, replace those which are damaged or destroyed by the Work.

H. Provide sheeting, shoring and bracing where required to safely complete the Work, to prevent excavation from extending beyond limits indicated on the Drawings and to protect the Work and adjacent structures or improvements. Use sheeting, shoring and bracing to protect workmen and the general public, and which conforms to requirements of Section 02280 Trench Safety Systems.

I. Prevent voids from forming outside of sheeting. Immediately fill voids with grout, cement-stabilized sand or other material approved by the Project Manager and compact to ninety-five percent (95%) standard density.

J. After completion of the structure, remove sheeting, shoring and bracing unless shown on the Drawings to remain in place or directed by the Project Manager in writing that such temporary structures may remain. Remove sheeting, shoring and bracing in such a manner as to maintain safety during backfilling operations and to prevent damage to the Work and adjacent structures or improvements.

K. Immediately fill and compact voids left or caused by removal of sheeting with cement-stabilized sand or other material approved by the Project Manager and compact to ninety-five percent (95%) standard density.

3.4 HANDLING EXCAVATED MATERIALS

A. Classify excavated materials: Place material which is suitable for use as backfill in orderly piles at sufficient distance from excavation to prevent slides or cave-ins.

B. Provide additional backfill material in accordance with requirements of Section 02110 Borrow, if adequate quantities of suitable material are not available from excavation and trenching operations at site.

3.5 DEWATERING

A. Provide ground water control per Section 01585 Control of Ground and Surface Water.

B. Keep ground water surface elevation minimum of two feet (2 Ft) below bottom of foundation base.

C. Maintain ground water control as directed by Section 01585 Control of Ground and Surface Water and until structure is sufficiently complete to provide required weight to resist hydrostatic uplift with minimum safety

factor of one and two tenths (1.2).

3.6 FOUNDATION EXCAVATION

A. Notify the Project Manager at least forty-eight hours (48 Hrs) prior to planned completion of foundation excavations. Do not place foundation base until excavation is accepted by the Project Manager.

B. Excavate to elevations shown on the Drawings to provide space for foundation base, forming a level undisturbed surface free of mud or soft material. Remove pockets of soft or otherwise unstable soils and replace with foundation backfill material or material as directed by the Project Manager. Prior to placing material over it, recompact subgrade where indicated on the Drawings, scarifying as needed, to ninety-five percent (95%) of maximum Standard Dry Density according to ASTM D698. If specified level of compaction cannot be achieved, moisture condition subgrade and recompact until ninety-five percent (95%) is achieved, over-excavate to provide minimum layer of twenty-four inches (24 In) of foundation backfill material or other means acceptable to the Project Manager.

C. Fill unauthorized excessive excavation with foundation backfill material or other suitable material as directed by the Project Manager.

D. Protect open excavations from rainfall, runoff, freezing groundwater or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition. Keep excavations free of standing water and completely free of water during concrete placement.

E. Remove soils which become unsuitable due to inadequate dewatering, or other causes, after initial excavation to required subgrade and replace with foundation backfill material, as directed by the Project Manager, at no additional cost to the City.

F. Place foundation base or foundation backfill material over subgrade where needed, on same day that excavation is completed to final grade. Where base of excavations are left open for longer periods, protect them with seal slab or cement-stabilized sand.

G. Use filter fabric as specified in Section 02015 Geotextile to separate crushed aggregate and other free draining Class I materials from native soils or select material backfill. Overlap fabric minimum of twelve inches (12 In) beyond where another material stops contact with soil.

H. Place crushed aggregate and other Class I materials in uniform layers of eight inch (8 In) maximum thickness. Perform compaction by means

of at least two (2) passes of vibratory compactor.

3.7 FOUNDATION BASE.

A. Place foundation base after subgrade is properly prepared, including placement of foundation backfill where needed. Use foundation base consisting of twelve inch (12 In) layer of crushed stone aggregate or cement-stabilized sand. Alternately, seal slab with minimum thickness of four inches (4 In) may be placed. Extend foundation base minimum of twelve inches (12 In) beyond edge of structure foundation, unless shown otherwise on the Drawings.

B. Where foundation base and foundation backfill are of same material, both can be placed in one (1) operation.

3.8 BACKFILL

A. Complete backfill to surface of natural ground or to lines and grades shown on the Drawings. Remove forms, lumber, trash and debris from structures. Use select fill for backfill. Existing material that qualifies as select material may be used, unless indicated otherwise on the Drawings. Deposit backfill in uniform layers and compact each layer as specified.

B. Do not place backfill against concrete walls or similar structures until laboratory test breaks indicate that concrete has reached minimum of eighty-five percent (85%) of specified compressive strength. Where walls are supported by slabs or intermediate walls, do not begin backfill operations until slab or intermediate walls have been placed and concrete has attained sufficient strength.

C. Remove concrete forms before starting backfill and remove shoring and bracing as work progresses.

D. Maintain backfill material at plus or minus three percent (±3%) of optimum moisture content, unless otherwise approved by the Project Manager. Place fill material in uniform eight inch (8 In) maximum loose layers. Compact fill to at least ninety-five percent (95%) of maximum Standard Proctor Density according to ASTM D698 below paved areas. Compact fill to at least ninety-five percent (95%) around structures below unpaved areas.

E. Where backfill is placed against sloped excavation surface, run compaction equipment across boundary of cut slope and backfill to form compacted slope surface for placement of next layer of backfill.

F. Place backfill using cement-stabilized sand in accordance with Section 02145 Cement-Stabilized Sand.

G. Hydraulic or pneumatic equipment shall be used for all backfill operations. At no time shall the lift exceed the specifications above, even when using heavy construction equipment as a compact device.

3.9 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Tests shall be performed initially on minimum of one (1) different sample of each material type for plasticity characteristics, in accordance with ASTM D4318 and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is a noticeable change in material gradation or plasticity.

C. In-place density tests of compacted subgrade and backfill shall be performed according to ASTM D1556 or ASTM D2922 and ASTM D3017 and at following frequencies and conditions:

1. Minimum of one (1) test for each lift of bedding and backfill material at intervals of five hundred feet (500 Ft) measured along the trench centerline or between every manhole, whichever results in greatest number of density tests, as determined by the Project Manager.

2. A minimum of three (3) density tests for each full work shift.

3. Density tests shall be performed in all placement areas.

4. Number of tests shall be increased when inspection determines that soil types or moisture contents are not uniform or when compacting effort is variable and not considered sufficient to attain uniform density.

5. Identify elevation of test with respect to natural ground.

6. Record approximate depth of lift tested.

D. At least one (1) test for moisture-density relationships shall be initially performed for each type of backfill material in accordance with ASTM D698. Perform additional moisture-density relationship test once a

month or whenever there is noticeable change in material gradation or plasticity.

E. When tests indicate work does not meet specified compaction requirements, recondition, recompact and retest at Contractor's expense.

3.10 DISPOSAL OF EXCESS MATERIAL

A. Excess material shall be the property of the Contractor and shall be disposed of properly with no cost to the City. Dispose of excess materials in accordance with requirements of Section 01580 – Waste Material Disposal.

END OF SECTION

SECTION 02125

EXCAVATION AND BACKFILL FOR UTILITIES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Excavation, trenching, foundation, embedment and backfill for installation of utilities, including manholes and other related structures.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for trench excavation, embedment and backfill under this Section. Include cost in unit price for installed underground piping, sewer, conduit or duct work.

2. When the Project Manager directs the Contractor to over-excavate trench bottom, the Contractor shall be paid by the unit price bid per linear foot under Bid Item Six inches (6 In) over-excavation of Trench Bottom.

   a. No payment shall be paid if the Project Manager does not direct the Contractor to over-excavate trench bottom.

   b. No over excavation shall be measured or paid when unsuitable conditions result from dewatering system not in conformance with Section 01585 Control of Ground and Surface Water.

3. No separate payment shall be made for performing Critical Location exploratory excavation. Include cost in the unit price for work requiring critical location.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in

this Section shall be included in Total Stipulated Price.

1.3 DEFINITIONS

A. Pipe Foundation: Suitable and stable native soils that are exposed at trench subgrade after excavation to depth of bottom of bedding as shown on the Drawings or foundation backfill material placed and compacted in over-excavations.

B. Pipe Bedding: Portion of trench backfill that extends vertically from top of foundation up to level line at bottom of pipe and horizontally from one (1) trench sidewall to opposite sidewall.

C. Haunching: Material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one (1) trench sidewall to opposite sidewall.

D. Initial Backfill: Portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to level line twelve inches (12 In) above top of pipe and horizontally from one (1) trench sidewall to opposite sidewall.

E. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.

F. Trench Zone: Portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.

G. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH and OL according to ASTM D2487.

2. Materials that cannot be compacted to required density due to gradation, plasticity or moisture content.

3. Materials that contain large clods, aggregates, stones greater than two inches (2 In) in any dimension, debris, vegetation, waste or any other deleterious materials.

4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

H. Suitable Material: Suitable soil materials are those meeting specification requirements. Materials mixed with lime or cement that

can be compacted to required density and meeting requirements for suitable materials may be considered suitable materials, unless otherwise indicated.

I. Backfill: Suitable material meeting specified quality requirements placed and compacted under controlled conditions.

J. Ground Water Control Systems: Installations external to trench, such as well points, eductors or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01585 Control of Ground and Surface Water.

K. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally entering trench shall be controlled and removed as part of excavation drainage.

L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using drainage layer, as defined in ASTM D2321, placed on foundation beneath pipe bedding or thickened bedding layer of Class I material.

M. Trench Conditions are defined with regard to stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.

1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.

2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.

a. Stable Trench with Seepage in Clay Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.

b. Stable Wet Trench in Sandy Soils: Excavation

drainage is provided in embedment zone in combination with ground water control in predominately sandy or silty soils.

N. Unstable Trench: Unstable trench conditions exist in pipe embedment zone if ground water inflow or high water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.

O. Sub-trench: Sub-trench is special case of benched excavation. Sub-trench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of sub-trench depends upon trench stability and safety as determined by Contractor.

P. Trench Dam: Placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along trench.

Q. Over-excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on the Drawings and backfilled with foundation backfill material.

R. Foundation Backfill Materials: Natural soil or manufactured aggregate of controlled gradation and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill to provide stable support for bedding. Foundation backfill materials may include concrete seal slabs.

S. Trench Safety Systems include both protective systems and shoring systems as defined in Section 02280 Trench Safety Systems.

T. Trench Shield (Trench Box): Portable worker safety structure moved along trench as work proceeds, used as protective system and designed to withstand forces imposed on it by cave-in, thereby protecting persons within trench. Trench shields may be stacked if so designed or placed in series depending on depth and length of excavation to be protected.

U. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins or to prevent movement of ground affecting adjacent installations or improvements.

V. Special Shoring: Shoring system meeting special shoring as specified in Paragraph 1.8, Special Shoring Design Requirements, for locations

identified on the Drawings.

1.4 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C12 Standard Practice for Installing Vitrified Clay Pipe Lines.

2. ASTM D558 Standard Test Methods for Moisture-Density Relations of Soil Cement Mixtures.

3. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft).

4. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

5. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

6. ASTM D2487 Standard Classification of Soils for Engineering Purposes.

7. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

8. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

9. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 01505 Temporary Facilities and Controls.

6. Section 01555 Traffic Control and Regulation.

7. Section 01560 Tree and Plant Protection.

8. Section 01580 Waste Material Disposal.

9. Section 01585 Control of Ground and Surface Water.

10. Section 01725 Field Surveying.

11. Section 02015 Geotextile.

12. Section 02105 Removing Existing Pavements and Structures.

13. Section 02140 Utility Backfill Materials.

14. Section 02280 Trench Safety Systems.

15. Section 03300 Structural Concrete.

C. OSHA Occupational Safety and Health Administration.

1. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

D. TxDOT Texas Department of Transportation.

1. TxDOT Tex-101-E Preparing Soil and Flexible Base Materials for Testing.

2. TxDOT Tex-110-E Particle Size Analysis of Soils.

1.5 SCHEDULING

A. Schedule work so that pipe embedment can be completed on same day that acceptable foundation has been achieved for each section of pipe installation, manhole or other related structures.

1.6 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.

2. Procedures for foundation and pipe zone bedding placement and trench backfill compaction.

3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information in accordance with requirements of Section 02140 Utility Backfill Materials.

D. Submit trench excavation safety program in accordance with requirements of Section 02280 Trench Safety Systems. Include designs for special shoring meeting requirements defined in Paragraph 1.8, Special Shoring Design Requirements contained herein.

E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts and gradients.

F. Submit eleven inch by seventeen inch (11 In x 17 In) copy of the Drawing with plotted utility or obstruction location titled "Critical Location Report" to the Project Manager.

1.7 TESTING

A. Testing and analysis of backfill materials for soil classification and compaction during construction shall be performed by an independent laboratory in accordance with requirements of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures and as specified in this Section.

B. Perform backfill material source qualification testing in accordance with requirements of Section 02140 Utility Backfill Materials.

1.8 SPECIAL SHORING DESIGN REQUIREMENTS

A. Have special shoring designed or selected by the Contractor's Professional Engineer to provide support for sides of excavations, including soils and hydrostatic ground water pressures as applicable and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by the Contractor's Professional Engineer licensed by the State of Texas to meet project site requirements based on manufacturer's standard design.

PART II: PRODUCTS

2.1 EQUIPMENT

A. Perform excavation with hydraulic excavator or other equipment suitable for achieving requirements of this Section.

B. Use only hand-operated pneumatic or hydraulic tamping equipment until minimum cover of twelve inches (12 In) is obtained over pipes, conduits and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits or ducts.

C. Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.

D. Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems or other systems meeting requirements as specified in Paragraph 1.8, Special Shoring Design Requirements.

2.2 MATERIAL CLASSIFICATIONS

A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Section 02140 □ Utility Backfill Materials.

B. Concrete Backfill: Conform to requirements for Class A concrete as specified in Section 03300 □ Structural Concrete.

C. Geotextile (Filter Fabric): Conform to requirements of Section 02015 □ Geotextile.

D. Concrete for Trench Dams: Concrete backfill or three (3) sack premixed (bag) concrete.

E. Timber Shoring Left in Place: Untreated oak.

PART III: EXECUTION

3.1 STANDARD PRACTICE

A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard

practice described in ASTM D2321 and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

B. Install rigid pipe to conform to standard practice described in ASTM C12 and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

C. Classification of material will be determined by the Project Manager.

3.2 PREPARATION

A. Establish traffic control to conform to requirements of Section 01555 Traffic Control and Regulation. Maintain barricades and warning lights for streets and intersections affected by the Work and are considered hazardous to traffic movements.

B. Perform work to conform to applicable safety standards and regulations. Employ trench safety system as specified in Section 02280 Trench Safety Systems.

C. Immediately notify agency or company owning any existing utility line which is damaged, broken or disturbed. Obtain approval from the Project Manager and agency for any repairs or relocations, either temporary or permanent.

D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Section 02105 Removing Existing Pavements and Structures, as applicable.

E. Install and operate necessary dewatering and surface-water control measures to conform to Section 01585 Control of Ground and Surface Water. Provide stable trench to allow installation in accordance with the Technical Specifications.

F. Maintain permanent benchmarks, monumentation and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Section 01725 Field Surveying.

3.3 CRITICAL LOCATION INVESTIGATION

A. Horizontal and vertical location of various underground lines shown on the Drawings, including but not limited to water lines, gas lines, storm sewers, sanitary sewers, telecommunication lines, electric lines or

power ducts, pipelines, concrete and debris, are based on best information available but are only approximate locations. **At Critical Locations shown on the Drawings, field verify horizontal and vertical locations of such lines within zone two feet (2 Ft) vertically and four feet (4 Ft) horizontally of the proposed work.**

1. Verify location of existing utilities a minimum of seven working days (7 wD) in advance of pipe laying activities based on daily pipe laying rate. Use extreme caution and care when uncovering these lines.

2. Notify the Project Manager in writing immediately upon identification of obstruction. In event of failure to identify obstruction a minimum of seven days (7 D) in advance, the Contractor shall not be entitled to extra cost for downtime including, but not limited to, payroll, equipment, overhead, demobilization and remobilization, until seven days (7 D) has passed from the time the Project Manager is notified of obstruction.

3. **Verify all locations where there is specified to be a tie-in into existing utilities or infrastructure before the start of excavation, so as to verify all grades and locations.** Failure to do so shall result in the replacement of the installed work at the Contractor's cost for any work installed before finding an error in elevations or locations.

B. Notify involved utility companies of date and time that excavation will occur and request that their respective utility lines be marked in field. Comply with utility or pipeline company requirements that their representative be present during excavation. Provide the Project Manager with at least forty-eight hours (48 Hrs) notice prior to excavation or related work.

C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot results on eleven inch by seventeen inch (11 In x 17 In) copy of the Drawings. For large diameter water lines, submit to the Project Manager for approval, with horizontal and vertical alignment dimensions for connections to existing lines tied into project baseline, and signed and sealed by Registered Professional Land Surveyor (R.P.L.S.) licensed by the State of Texas.

3.4 PROTECTION

A. Protect trees, shrubs, lawns, existing structures and other permanent objects outside of grading limits and within grading limits as designated

on Drawings and in accordance with requirements of Section 01560 Tree and Plant Protection.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on the Drawings.

D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements or areas with loss of density or pavement failures or potholes occur, repair, recompact and pave those areas at no additional cost to the City.

3.5 EXCAVATION

A. Except as otherwise specified or shown on the Drawings, install underground utilities in open cut trenches with vertical sides.

B. Perform excavation work so that pipe, conduit and ducts can be installed to depths and alignments shown on the Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

C. Determine trench excavation widths using TABLE 4.1 TRENCH EXCAVATION WIDTHS as related to pipe outside diameter (O.D.), in this Section.

D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill and other materials.

E. Upon discovery of unknown utilities, badly deteriorated utilities, utilities not designated for removal or concealed conditions, discontinue work at that location. Notify the Project Manager and obtain instructions before proceeding.

F. Shoring of Trench Walls.

1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.

2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.

3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by the Project Manager. Leave rangers, walers and braces in place as long as required to support sheeting, which has been cut off and trench wall in vicinity of pipe zone.

4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.

5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of one inch (1 In) thick steel plate. As sheeting is removed, fill in voids left with grouting material.

G. Use of Trench Shields: When trench shield (trench box) is used as worker safety device, the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.

2. Move trench shields so that pipe and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re-compact after shield is moved if soil is disturbed.

3. When required, place, spread and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.

4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.

5. Conform to applicable Government regulations.

H. Voids under paving area outside shield caused by the Contractor's work will require removal of pavement, consolidation and replacement of pavement in accordance with the Contract Documents. Repair damage resulting from failure to provide adequate supports.

I. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.

J. Coordinate excavation within fifteen feet (15 Ft) of any products pipeline with company's representative. Support pipeline with methods agreed to by the Pipeline Company's representative. Use small, rubber tired excavator such as a backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have guard installed over teeth to approximate bucket without teeth. Excavate by hand within one foot (1 Ft) of the pipeline. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by the Pipeline Company's representative.

K. When, during excavation to uncover pipelines, a screwed collar or an oxyacetylene weld is exposed, immediately notify the Project Manager. Provide supports for collar or welds. Discuss with the Pipeline Company's representative and determine methods of supporting collar or weld during excavation and later backfilling operations. When collar is exposed, request the Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.

3.6 HANDLING EXCAVATED MATERIALS

A. Use only excavated materials, which are suitable as defined in this Section and conforming to Section 02140 Utility Backfill Materials. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.

B. When required, provide additional backfill material conforming to requirements of Section 02140 Utility Backfill Materials.

C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Maintain site conditions in accordance with Section 01505 Temporary

Facilities and Controls. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

3.7 TRENCH FOUNDATION

A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

B. When wet soil is encountered on trench bottom and dewatering system is not required, over excavate an additional six inches (6 In) with approval by the Project Manager. Place non-woven geotextile fabric and then compact twelve inches (12 In) of crushed stone in one lift on top of fabric. Compact crushed stone with four (4) passes of vibratory-type compaction equipment.

C. Perform over-excavation, if directed by the Project Manager, in accordance with Paragraph 3.7.B above. Removal of unstable or unsuitable material may be required if approved by the Project Manager;

1. Even though the Contractor has not determined material to be unsuitable or;

2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating according to Section 01585 Control of Ground and Surface Water.

D. Place trench dams in Class I foundations in line segments longer than one hundred feet (100 Ft) between manholes and not less than one (1) in every five hundred feet (500 Ft) of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than five feet (5 Ft) from manholes.

3.8 PIPE EMBEDMENT, PLACEMENT AND COMPACTION

A. Remove loose, sloughing, caving or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.

B. Place embedment including bedding, haunching and initial backfill as shown on the Drawings.

C. For pipe installation, manually spread embedment materials around

pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and compaction directly against undisturbed soils in trench sidewalls or against sheeting which is to remain in place.

D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.

E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.

F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.

H. Place electrical conduit, if used, directly on foundation without bedding.

I. Shovel in-place and compact embedment material using pneumatic or hydraulic tampers in restricted areas and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping or jetting shall not allowed.

J. For water lines construction embedment, use bank run sand concrete sand gem sand pea gravel or crushed limestone as specified in Section 02140 Utility Backfill Material. For water lines adhere to the following subparagraph numbers 1 and 2; for utility installation other than water, adhere to numbers 3 and 4 below:

1. Class I, II and III Embedment Materials:

   a. Maximum six inches (6 In) compacted lift thickness.

   b. Compact to achieve minimum of ninety-five percent (95%) of maximum dry density as determined according to ASTM D698.

c. Moisture content to be within plus or minus three percent (±3%) of optimum as determined according to ASTM D698, unless otherwise approved by the Project Manager.

2. Cement-Stabilized Sand (where required for special installations):

   a. Maximum six inches (6 In) compacted thickness.

   b. Compact to achieve minimum of ninety-five percent (95%) of maximum dry density as determined according to ASTM D698.

   c. Moisture content to be on dry side of optimum as determined according to ASTM D698 but sufficient for effective hydration.

3. Class I Embedment Materials:

   a. Maximum six inches (6 In) compacted lift thickness.

   b. Systematic compaction by at least two (2) passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.

   c. Moisture content as determined by the Contractor for effective compaction without softening soil of trench bottom, foundation or trench walls.

4. Class II Embedment and Cement-Stabilized Sand:

   a. Maximum six inches (6 In) compacted thickness.

   b. Compaction by methods determined by the Contractor to achieve minimum of ninety-five percent (95%) of maximum dry density as determined according to ASTM D698 for Class II materials and according to ASTM D558 for Cement-Stabilized materials.

   c. Moisture content of Class II materials within three percent (±3%) of optimum as determined according to ASTM D698. Moisture content of Cement-Stabilized sands on dry side of optimum as determined according

to ASTM D558 but sufficient for effective hydration.

K. Place trench dams in Class I embedment in line segments longer than one hundred feet (100 Ft) between manholes and not less than one (1) in every five hundred feet (500 Ft) of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than five feet (5 Ft) from manholes.

3.9 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.

B. For water lines, backfill in trench zone, including auger pits, intermediate and site pits, with bank run sand select fill or random backfill material as specified in Section 02140 Utility Backfill materials.

C. For sewer pipes, use backfill materials described by trench limits. For "trench zone backfill" under pavement and to within one foot (1 Ft) back of curb, use Cement-Stabilized sand for pipes of nominal sizes thirty-six inches (36 In) in diameter and smaller to level twelve inches (12 In) below the pavement. For sewer pipes forty-two inches (42 In) in diameter and larger, under pavement or natural ground, in satisfactory soil conditions, backfill from twelve inches (12 In) above top of pipe to twelve inches (12 In) below pavement with suitable on-site material or select backfill. For sewer pipes forty-two inches (42 In) in diameter and larger, under pavement or natural ground, in unsatisfactory soil conditions, backfill from twelve inches (12 In) above top of pipe to twelve inches (12 In) below pavement with suitable on-site material or select backfill. Use select backfill for rigid pavements or flexible base material for asphalt pavements for twelve (12) inch backfill directly under pavement. For backfill materials reference Section 02140 Utility Backfill Materials.

D. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave sheeting in place. Cut off sheeting one and one-half feet (1-1/2 Ft) or more above crown of pipe. Remove trench supports within five feet (5 Ft) from ground surface.

E. When shown on Drawings, random backfill of suitable material may be used in trench zone for trench excavations outside pavements.

F. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift.

1. Class I, II, III or IV or combination thereof (Random Backfill):

   a. Maximum eight inches (8 In) compacted lift thickness.

   b. Compact by vibratory equipment to minimum of ninety-five percent (95%) of maximum dry density determined according to ASTM D698.

   c. Moisture content within plus or minus three percent (±3%) of optimum determined according to ASTM D698, unless otherwise approved by the Project Manager.

2. Cement-Stabilized Sand:

   a. Maximum lift thickness determined by the Contractor to achieve uniform placement and required compaction, but not to exceed twelve inches (12 In).

   b. Compact by vibratory equipment to minimum of ninety-five percent (95%) of maximum dry density determined according to ASTM D558.

   c. Moisture content on dry side of optimum determined according to ASTM D558 but sufficient for cement hydration.

3. Select Backfill:

   a. Place in maximum eight inch (8 In) loose layers.

   b. Compaction by equipment providing tamping or kneading impact to minimum of ninety-five percent (95%) of maximum dry density determined according to ASTM D698.

   c. Moisture content within plus or minus three percent (±3%) above optimum determined according to ASTM D698, unless approved by the Project Manager.

G. Unless otherwise shown on the Drawings, for trench excavations not under pavement or in the right of way, random backfill of suitable material may be used in trench zone as directed by the Project Manager.

   1. Fat clays (CH) may be used as trench zone backfill outside

paved areas at the Contractor's option. When required density is not achieved, rework, dry out, use lime stabilization or other approved methods to achieve compaction requirements or use different suitable material at no additional cost to the City.

2. Maximum eight inch (8 In) compacted lift thickness for clayey soils and maximum eight inch (8 In) lift thickness for granular soils.

3. Compact to minimum of ninety percent (90%) of maximum dry density determined according to ASTM D698.

4. Moisture content as necessary to achieve density.

H. For electric conduits, remove form work used for construction of conduits before placing trench zone backfill.

I. Water soaking, jetting or compaction by backhoe bucket is not acceptable and shall not be used.

3.10 MANHOLES, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

A. Meet requirements of adjoining utility installations for backfill of pipeline structures, as shown on the Drawings.

B. Below paved areas, encapsulate manhole with Cement-Stabilized sand; minimum of one foot (1 Ft) below base, minimum one foot (1 Ft) around walls, up to within twelve inches (12 In) of pavement subgrade. Compact in accordance with Paragraph 3.9.F.2 of this Section.

C. In unpaved areas, use select fill for backfill. Existing material that qualifies as select material may be used, unless indicated otherwise on the Drawings. Deposit backfill in uniform layers and compact each layer as specified. Maintain backfill material at plus or minus three percent (±3%) of optimum moisture content, unless otherwise approved by the Project Manager. Place fill material in uniform eight inch (8 In) maximum loose layers. Compact fill to at least ninety-five percent (95%) of maximum Standard Proctor Density according to ASTM D698.

3.11 FIELD QUALITY CONTROL

A. Test for material source qualifications as defined in Section 02140 Utility Backfill Materials.

B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no

additional cost to the City.

C. Tests will be performed on minimum of three (3) different samples of each material type for plasticity characteristics, in accordance with ASTM D4318 and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests shall be performed whenever there is noticeable change in material gradation or plasticity or when requested by the Project Manager.

D. At least three (3) tests for moisture-density relationships shall be performed initially for backfill materials in accordance with ASTM D698 and for cement-stabilized sand in accordance with ASTM D558. Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials shall be performed according to ASTM D1556 or ASTM D2922 and ASTM D3017 and at following frequencies and conditions:

1. For open cut construction projects and auger pits: Unless otherwise approved by the Project Manager, successful compaction to be measured by one (1) test per one hundred linear feet (100 Lf) measured along pipe for compacted embedment and one (1) test per one hundred linear feet (100 Lf) measured along pipe for compacted trench zone backfill material and one (1) test at each auger pit.

2. A minimum of three (3) density tests for each full shift of Work.

3. Density tests shall be distributed among placement areas. Placement areas are: foundation, bedding, haunching, initial backfill and trench zone.

4. The number of tests shall be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.

5. Density tests at various depths below fill surface, if required, shall be performed by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.

6. Two (2) verification tests shall be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show

acceptable results.

7. Recompacted placement shall be retested at same frequency as first test series, including verification tests.

8. Identify elevation of test with respect to natural ground or pavement.

F. Recondition, recompact and retest at the Contractor's expense if tests indicate the Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at the Contractor's expense.

G. Acceptability of crushed rock compaction will be determined by inspection.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Excess material shall be the property of the Contractor and shall be disposed of properly with no cost to the City. Dispose of excess materials in accordance with requirements of Section 01580 – Waste Material Disposal.

PART IV: TABLES

4.1 TABLE EXCAVATION WIDTHS

Nominal Pipe Size, inches	Minimum Trench Width, inches
Less than 18"	O.D. + 18"
18" to 30"	O.D. + 24"
36" to 42"	O.D. + 36"
Greater than 42"	O.D. + 48"

END OF SECTION

SECTION 02130

EXTRA UNIT PRICE WORK FOR EXCAVATION AND BACKFILL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Measurement and payment applicable to extra unit price work items for excavation and backfill made necessary by unusual or unforeseen circumstances encountered during utility installations.

B. Extra unit price work for excavation and backfill shall be paid only when authorized in advance by the Project Manager.

1.2 UNIT PRICES:

A. Extra Excavation Around Obstructions: Payment for excavation around obstructions shall be on a cubic yard basis, measured in place, without deduction for volume occupied by portions of pipes, ducts, or other structures left in place across trenches excavated under this item.

B. Extra Hand Excavation: Payment for extra hand excavation shall be on a cubic yard basis, measured in place.

C. Extra Machine Excavation: Payment for extra machine excavation shall be on a cubic yard basis, measured in place.

D. Extra Placement of Backfill Material: Payment for extra placement of backfill material shall be on a cubic yard basis, measured in place, for material installed as part of the Work. At discretion of the Project Manager, measurement of cubic yards may be calculated from volume of Extra Hand Excavation or Extra Machine Excavation for which replacement is made, minus volume of any Extra Placement of Granular Backfill authorized in conjunction with the Work.

E. Extra Placement of Granular Backfill: Payment for extra placement of granular backfill material shall be on a cubic yard basis, measured in place.

F. No separate payment will be made for surface water control, groundwater control, or for excavation drainage. Refer to Section 01270 Measurement and Payment for unit price procedures.

1.3 DEFINITIONS

A. Excavation Around Obstructions: Excavation necessitated by obstruction of pipes (other than service connections three inches (3 in) in diameter or less), ducts, or other structures, not shown on the Drawings, and of an unusual or unforeseen nature which interfere with installation of utility piping by normal methods of excavation or auguring.

B. Extra Hand Excavation: Excavation by manual labor made necessary by unusual or unforeseen circumstances at locations approved in advance by the Project Manager.

C. Extra Machine Excavation: Excavation by machine at or near project site to perform related work not included in original project scope but added for convenience of the City, as approved in advance by the Project Manager.

D. Extra Replacement of Backfill Material: Handling, backfill, and compaction of excavated material authorized under extra work bid items for Extra Hand Excavation or Extra Machine Excavation as approved in advance by the Project Manager. Placement and compaction shall conform to requirements specified for excavation and backfill in Division 2 - Site Work.

E. Extra Placement of Granular Backfill: Hauling, placing, and compacting granular backfill materials as approved by the Project Manager in conjunction with Extra Replacement of Backfill Material. Materials placed under this item shall conform to requirements for Bank Run Sand, Cement Stabilized Sand, Concrete Sand, Gem Sand, Crushed Stone, or Crushed Concrete specified for backfill material in Division 2 - Site Work.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

PART II: PRODUCTS Not Used

PART III: EXECUTION Not Used

END OF SECTION

SECTION 02135

EXCAVATION FOR ROADWAY

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Excavation and compaction of materials for roadways.

B. Excavation and compaction of materials for roadside ditches.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for roadway excavation shall be on a cubic yard basis.

2. No payment will be made for material excavated under the following conditions:

a. More than two feet (2 Ft) outside of vertical planes behind back of curbs.

b. For portion within limits of trench for utilities twenty-four inch (24 In) and greater constructed by open-cut methods.

c. As indicated otherwise on the Drawings.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM □ American Society for Testing and Materials.

1. ASTM D698 □ Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

(12.44 ft-lbf/ft^3).

2. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

3. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM D3017 – Standard Test Method for Water content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

5. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 01580 – Waste Material Disposal.

6. Section 01725 – Field Surveying.

7. Section 02115 – Embankment.

8. Section 02905 – Topsoil.

C. TCEQ – Texas Commission on Environmental Quality.

D. TDH – Texas Department of Health.

E. RRC – Railroad Commission of Texas.

PART II: PRODUCTS

2.1 MATERIALS

A. Provide topsoil conforming to requirements of Section 02905 – Topsoil.

B. Provide backfill which is excavated material, graded free of roots, lumps greater than six inches (6 In), rocks larger than three inches (3 In), organic material and debris.

C. Provide structural backfill which is select material meeting following requirements:

1. Plasticity index: Not less than twelve (12) or more than twenty (20).

2. Maximum liquid limit: Forty-five (45).

PART III: EXECUTION

3.1 PREPARATION

A. Identify required lines, levels and datum. Coordinate with Section 01725 Field Surveying.

B. Identify and flag surface and aerial utilities.

C. Notify utility companies to remove or relocate utilities.

D. Identify, stake and flag known utility locations below grade. Make temporary or permanent relocation of underground pipes, ducts or utilities where indicated on the Drawings.

E. Upon discovery of unknown or badly deteriorated utilities or concealed conditions, discontinue work. Notify the Project Manager and obtain instructions before proceeding in such areas.

F. Obtain approval of top soil quality before excavating and stockpiling.

3.2 PROTECTION

A. Protect following from damage or displacement:

1. Trees, shrubs, lawns, existing structures and other features outside of grading limits.

2. Utilities either above or below grade, which are to remain.

3.3 TOPSOIL REMOVAL

A. Strip off topsoil from area to be excavated to minimum depth of six

inches (6 In), unless indicated otherwise on the Drawings.

B. Stockpile topsoil in designated location for reuse. Stockpile topsoil to depth not exceeding eight feet (8 Ft). Cover to protect from erosion.

3.4 SOIL EXCAVATION

A. Excavate to lines and grades shown on the Drawings.

B. Remove unsuitable material not meeting specifications. Backfill with embankment materials and compact to requirements of Section 02115 Embankment.

C. Record location and plug and fill inactive water and oil wells. Conform to Texas Department of Health, Texas Commission on Environmental Quality and Texas Railroad Commission requirements. Notify the Project Manager prior to plugging wells.

D. At intersections, grade back at minimum slope of one inch per foot (1 In/Ft). Produce smooth riding junction with intersecting street. Maintain proper drainage.

E. When area is inadvertently over-excavated, fill area in accordance with requirements of Section 02115 Embankment at no additional cost to the City.

F. Remove material not qualified for use and excess soil not being reused from site in accordance with requirements of Section 01580 Waste Material Disposal.

3.5 COMPACTION

A. Maintain optimum moisture content of subgrade to attain required density.

B. Compact to following minimum densities at moisture content of optimum to plus or minus three percent (±3%) optimum as determined by ASTM D698, unless otherwise indicated on the Drawings:

1. Areas under future paving and shoulders: Minimum density of ninety-five percent (95%) of maximum dry density.

2. Other areas: Minimum density of ninety percent (90%) of maximum dry density.

3.6 TOLERANCES

A. Top of Compacted Surface: Plus or minus one-half inch (±1/2 In) in cross section or in sixteen feet (16 Ft) longitudinally.

3.7 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Test and analysis of soil materials shall be performed in accordance with ASTM D4318, ASTM D2216 and ASTM D698.

C. Compaction testing shall be performed in accordance with ASTM D698 or ASTM D2922 and ASTM D3017.

D. A minimum of three (3) tests shall be taken for each one thousand linear feet (1000 Lf) per lane of roadway at random locations as specified by the the Project Manager.

E. When tests indicate work does not meet specified compaction requirements, recondition, recompact and retest at no additional cost to the City.

3.8 PROTECTION

A. Prevent erosion at all times. Maintain ditches and cut temporary swales to allow natural drainage in order to avoid damage to roadway. Do not allow water to pond.

B. Distribute construction traffic evenly over compacted areas, where practical, to aid in obtaining uniform compaction. Protect exposed areas having high moisture content from wheel loads that cause rutting.

C. Maintain excavation and embankment areas until start of subsequent work. Repair and recompact slides, washouts, settlements or areas with loss of density.

END OF SECTION

SECTION 02140

UTILITY BACKFILL MATERIALS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Material Classifications.

B. Utility Backfill Materials:

1. Concrete sand.
2. Gem sand.
3. Pea gravel.
4. Crushed stone.
5. Crushed concrete.
6. Bank run sand.
7. Select backfill.
8. Random backfill.

C. Material Handling and Quality Control Requirements.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for backfill material. Include payment in unit price for applicable utility installation.

2. Payment for backfill material, when included as separate pay item or when directed by the Project Manager, shall be on a cubic yard basis for material placed and compacted within theoretical trench width limits and thickness of material according to the Drawings or as directed by the Project Manager.

3. Payment for backfill of authorized over-excavation is in accordance with Section 02130 Extra Unit Price Work for Excavation and Backfill.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 DEFINITIONS

A. Unsuitable Material:

1. Materials classified as ML, CL-ML, MH, PT, OH and OL according to ASTM D2487.

2. Materials that cannot be compacted to required density due to gradation, plasticity or moisture content.

3. Materials containing large clods, aggregates or stones greater than four inches (4 In) in any dimension; debris, vegetation or waste; or any other deleterious materials.

4. Materials contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material:

1. Materials meeting specification requirements.

2. Unsuitable materials meeting specification requirements for suitable soils after treatment with lime or cement.

C. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material shall be placed and compacted as backfill where needed to provide stable support for structure foundation base. Foundation backfill materials may include concrete fill and seal slabs as directed by the Project Manager.

D. Foundation Base: Crushed stone aggregate with filter fabric as required, cement-stabilized sand or concrete seal slab. Foundation

base provides smooth, level working surface for construction of concrete foundation.

E. Backfill Material: Classified soil material meeting specified quality requirements for designated application as embedment or trench zone backfill.

F. Embedment Material: Soil material placed under controlled conditions within embedment zone extending vertically upward from top of foundation to an elevation twelve inches (12 In) above top of pipe and including pipe bedding, haunching and initial backfill.

G. Trench Zone Backfill: Classified soil material meeting specified quality requirements and placed under controlled conditions in trench zone from top of embedment zone to base course in paved areas or to surface grading material in unpaved areas.

H. Foundation: Either suitable soil of trench bottom or material placed as backfill of over-excavation for removal and replacement of unsuitable or otherwise unstable soils.

I. Source: Source selected by the Contractor for supply of embedment or trench zone backfill material. Selected source may be project excavation, off-site borrow pits, commercial borrow pits or sand and aggregate production or manufacturing plants, subject to approval by the Project Manager.

J. Refer to Section 02125 Excavation and Backfill for Utilities for other definitions regarding utility installation by trench construction.

1.4 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C33 Standard Specification for Concrete Aggregate.

2. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

3. ASTM C123 Standard Test Method for Lightweight Particles in Aggregate.

4. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine.

5. ASTM C136 □ Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

6. ASTM C142 □ Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

7. ASTM D1140 □ Standard Test Method for Amount of Material in Soils Finer Than No. 200 Sieve.

8. ASTM D2487 □ Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

9. ASTM D4318 □ Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

10. ASTM D4643 □ Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01470 □ Testing Laboratory Services.

4. Section 01475 □ Quality Control Testing Procedures.

5. Section 02120 □ Excavation and Backfill for Structures.

6. Section 02125 □ Excavation and Backfill for Utilities.

7. Section 02130 □ Extra Unit Price Work for Excavation and Backfill.

8. Section 02145 □ Cement-Stabilized Sand.

9. Section 02700 □ Cement-Stabilized Base Course.

10. Section 02705 □ Crushed Concrete Base Course.

11. Section 02715 □ Hot-Mix Asphaltic Base Course.

12. Section 02845 □ Pavement Repair and Resurfacing.

13. Section 03300 □ Structural Concrete.

C. TxDOT Texas Department of Transportation.

1. TxDOT Tex-110-E Determining Particle Size Analysis of Soils.

2. TxDOT Tex-460-A Material Finer Than 75 Fm (No.200) Sieve In Mineral Aggregates (Decantation Test for Concrete Aggregates).

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit description of source, material classification and product description, production method and application of backfill materials.

C. Submit test results for samples of off-site backfill materials. Comply with Paragraph 2.3, Material Testing.

D. Before stockpiling materials, submit copy of approval from landowner for stockpiling backfill material on a private property.

E. Provide delivery ticket which includes source location for each delivery of material that is obtained from off-site sources or is being paid as a specific bid item.

1.6 TESTS

A. Perform tests of sources for backfill material in accordance with Paragraph 2.3.B.

B. Verification tests of backfill materials shall be performed by the City in accordance with Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures and in accordance with Paragraph 3.3.

1.7 EMBEDEMENT

A. Gravity Sanitary Sewers and Storm sewers shall use Cement-Stabilized Sand for bedding, haunching and initial backfill.

B. Water lines and Force Main Sewers shall use Bank run sand for bedding, haunching and initial backfill.

PART II: PRODUCTS

2.1 MATERIAL CLASSIFICATIONS

A. Classify materials for backfill for purpose of quality control in accordance with Unified Soil Classification Symbols as defined in ASTM D2487. Material use and application is defined in utility installation specifications and the Drawings either by class, as described in Paragraph 2.1.B or by product descriptions, as given in Paragraph 2.2.

B. Class Designations Based on Laboratory Testing:

1. Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW, SW):

   a. Plasticity index: Non-plastic.

   b. Gradation: D_{60}/D_{10} □ greater than four percent (4%); amount passing No. 200 sieve □ less than or equal to five percent (5%).

2. Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines (GM, GP, SP, SM):

   a. Plasticity index: Non-plastic to four (4).

   b. Gradations:

      1) Gradation (GP, SP): amount passing No. 200 sieve □ less than five percent (5%).

      2) Gradation (GM, SM): amount passing No. 200 sieve □ between twelve percent (12%) and fifty percent (50%).

      3) Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve □ between five percent (5%) and twelve percent (12%).

3. Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt and clay (GC, SC and dual classifications, e.g., SP-SC):

a. Plasticity index: Greater than seven (7).

b. Gradation: Amount passing No. 200 sieve between twelve percent (12%) and fifty percent (50%).

4. Class IVA: Lean clays (CL).

a. Plasticity Indexes:

1) Plasticity index: Greater than seven (7) and above A line.

2) Borderline plasticity with dual classifications (CL-ML): PI between four (4) and seven (7).

b. Liquid limit: Less than fifty (50).

c. Gradation: Amount passing No. 200 sieve greater than fifty percent (50%).

d. Inorganic.

5. Class IVB: Fat clays (CH).

a. Plasticity index: Above A line.

b. Liquid limit: Fifty (50) or greater.

c. Gradation: Amount passing No. 200 sieve greater than fifty percent (50%).

d. Inorganic.

6. Use soils with dual class designation according to ASTM D2487 and which are not defined above, according to more restrictive class.

2.2 PRODUCT DESCRIPTIONS

A. Soils classified as silt (ML) silty clay (CL-ML with PI of four (4) to seven (7), elastic silt (MH), organic clay and organic silt (OL, OH) and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by the Project Manager. Soils in Class IVB, fat clay (CH) may be used as backfill materials where allowed by applicable backfill installation specification. Refer to Section 02120 Excavation and

Backfill for Structures and Section 02125 Excavation and Backfill for Utilities.

B. Provide backfill material that is free of stones greater than six inches (6 In), free of roots, waste, debris, trash, organic material, unstable material, non-soil matter, hydrocarbon or other contamination, conforming to following limits for deleterious materials:

1. Clay lumps: Less than one-half percent (1/2%) for Class I and less than two percent (2%) for Class II, when tested in accordance with ASTM C142.

2. Lightweight pieces: Less than five percent (5%) when tested in accordance with ASTM C123.

3. Organic impurities: No color darker than standard color when tested in accordance with ASTM C40.

C. Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in product specification and as approved by the Project Manager, provided that physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand: Durable bank run sand classified as SP, SW or SM by Unified Soil Classification System (ASTM D2487) meeting following requirements:

1. Less than fifteen percent (15%) passing No. 200 sieve when tested in accordance with ASTM D1140. Amount of clay lumps or balls may not exceed two percent (2%).

2. Material passing No. 40 sieve shall meet the following requirements when tested in accordance with ASTM D4318: Plasticity index: not exceeding seven (7).

E. Concrete Sand: Natural sand, manufactured sand or combination of natural and manufactured sand conforming to requirements of ASTM C33 and graded within limits specified in Table 4.1 SIEVE ANALYSIS REQUIREMENTS FOR CONCRETE SAND in this section, when tested in accordance with ASTM C136.

F. Gem Sand: Sand conforming to requirements of ASTM C33 for course aggregates specified for No. 8 size and graded within the limits specified in Table 4.2 SIEVE ANALYSIS REQUIREMENTS FOR GEM SAND in this section, when tested in accordance with ASTM C136.

G. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the limits specified in Table 4.3 SIEVE ANALYSIS REQUIREMENTS FOR PEA GRAVEL in this section, when tested in accordance with ASTM C136.

H. Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. Materials of one (1) product delivered for same construction activity from single source, unless otherwise approved by the Project Manager.

2. Non-plastic fines.

3. Los Angeles abrasion test wear not exceeding forty-five percent (45%) when tested in accordance with ASTM C131.

4. Crushed aggregate shall have minimum of ninety percent (90%) of particles retained on a No. 4 sieve with two (2) or more crushed faces as determined by Tex-460-A, Part I.

5. Crushed stone: Produced from oversize plant processed stone or gravel, sized by crushing to predominantly angular particles from naturally occurring single source. Uncrushed gravel is not acceptable materials for embedment where crushed stone is shown on applicable utility embedment drawing details.

6. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate) or debris.

7. Gradations, as determined in Table 4.4 SIEVE ANALYSIS REQUIREMENTS FOR CRUSHED AGGREGATE in this section, in accordance with Tex-110-E.

I. Select Backfill: Class III clayey gravel or sand or Class IV lean clay with plasticity index between seven (7) and twenty (20) or clayey soils treated with lime in accordance with Section 02845 Pavement Repair and Resurfacing, to meet plasticity criteria.

J. Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by applicable backfill installation specification. Refer to Section 02120 Excavation and Backfill for Structures and Section 02125 Excavation and Backfill for Utilities.

K. Cement-Stabilized Sand: Conform to requirements of Section 02145 Cement-Stabilized Sand.

L. Concrete Backfill: Conform to Class A concrete as specified in Section 03300 Structural Concrete.

M. Flexible Base Course Material: Conform to requirements of applicable portions of Section 02700 Cement-Stabilized Base Course, Section 02705 Crushed Concrete Base Course and Section 02715 Hot-Mix Asphaltic Base Course.

2.3 MATERIAL TESTING

A. Source Qualification: Perform testing to obtain tests by suppliers for selection of material sources and products not from the project site. Test samples of processed materials from current production representing material to be delivered. Use tests to verify that materials meet specification requirements. Repeat qualification test procedures each time source characteristics change or there is planned change in source location or supplier. Include the following qualification tests, as applicable:

1. Gradation: Report complete sieve analyses regardless of specified control sieves from largest particle through No. 200 sieve.

2. Plasticity of material passing No. 40 sieve.

3. Los Angeles abrasion wear of material retained on a No. 4 sieve.

4. Clay lumps.

5. Lightweight pieces.

6. Organic impurities.

B. Production Testing: Provide reports to the Project Manager from an independent testing laboratory that backfill materials to be placed in the

Work meet applicable specification requirements.

C. Assist the Project Manager in obtaining material samples for verification testing at source or at production plant.

PART III: EXECUTION

3.1 SOURCES

A. Use of existing material in trench excavations is acceptable, provided applicable Technical Specification requirements are satisfied.

B. Identify off-site sources for backfill materials at least fourteen days (14 D) ahead of intended use so that the Project Manager may obtain samples for verification testing.

C. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet requirements of specifications shall be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials or by contamination. Once material is approved by the Project Manager, expense for sampling and testing required to change to different material shall be arranged and paid for by the Contractor.

D. Bank run sand, select backfill and random backfill, if available in project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete work from off-site sources.

E. The City does not represent or guarantee that any soil found in excavation work will be suitable and acceptable as backfill material.

3.2 MATERIAL HANDLING

A. When backfill material is obtained from either commercial or non-commercial borrow pit, open pit to expose vertical faces of various strata for identification and selection of approved material to be used. Excavate selected material by vertical cuts extending through exposed strata to achieve uniformity in product.

B. Establish temporary stockpile locations for practical material handling, control and verification testing by the Project Manager in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

C. When stockpiling backfill material near project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering drainage system.

D. Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

3.3 FIELD QUALITY CONTROL

A. Quality Control.

1. The Project Manager may sample and test backfill at:

a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.

b. On-site stockpiles.

c. Materials placed in the Work.

2. The Project Manager may re-sample material at any stage of work or location if changes in characteristics are apparent.

B. Production Verification Testing: A Certified testing laboratory as described in Section 01470 Testing Laboratory Services, will provide verification testing on backfill materials, as directed by the Project Manager. Samples may be taken at source or at production plant, as applicable.

PART IV: TABLES

4.1 SIEVE ANALYSIS REQUIREMENTS FOR CONCRETE SAND

Sieve	Percent Passing
3/8	100%
No. 4	95% to 100%
No. 8	80% to 100%
No. 16	50% to 85%
No. 30	25% to 60%
No. 50	10% to 30%
No. 100	2% to 10%

4.2 SIEVE ANALYSIS REQUIREMENTS FOR GEM SAND

Sieve	Percent Passing
3/8□	95% to 100%
No. 4	60% to 80%
No. 8	15% to 40%

4.3 SIEVE ANALYSIS REQUIREMENTS FOR PEA GRAVEL

Sieve	Percent Passing
1/2"	100%
3/8□	85% to 100%
No. 4	10% to 30%
No. 8	0% to 10%
No. 16	0% to 5%

4.4 SIEVE ANALYSIS REQUIREMENTS FOR CRUSHED AGGREGATES

Sieve	Percent Passing by Weight for Pipe Embedment by Ranges of Nominal Pipe Sizes		
	>15□	15□ to 8□	<8□
1□	95% to 100%	100%	- -
3/4"	60% to 90%	90% to 100%	100%
1/2"	25% to 60%	- -	90% to 100%
3/8□	- -	20% to 55%	40% to 70%
No. 4	0% to 5%	0% to 10%	0% to 15%
No. 8	- -	0% to 5%	0% to 5%

END OF SECTION

SECTION 02145

CEMENT-STABILIZED SAND

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cement-stabilized sand.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for work performed under this Section. Include cost of such work in Contract unit prices for items listed in Unit Price Form requiring cement-stabilized sand.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C33 Standard Specification for Concrete Aggregates (Fine Aggregate).

2. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

3. ASTM C42 Standard Test Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

4. ASTM C94 Standard Specification for Ready-Mixed Concrete.

5. ASTM C123 Standard Test Method for Lightweight Particles

in Aggregate.

6. ASTM C142 – Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

7. ASTM C150 – Specification for Portland Cement.

8. ASTM D558 – Standard Test Method for Moisture-Density Relations of Soil Cement-Mixtures.

9. ASTM D1632 – Standard Practice for Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory.

10. ASTM D1633 – Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

11. ASTM D2487 – Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

12. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

13. ASTM D3665 – Standard Practice for Random Sampling of Construction Materials.

14. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 02140 – Utility Backfill Materials.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit proposed target cement content and production data for sand-

cement mixture in accordance with requirements of Paragraph 2.3, Materials Qualifications.

1.5 DESIGN REQUIREMENTS

A. Use sand-cement mixture producing minimum unconfined compressive strength of one hundred (100 psi) in forty-eight hours (48 Hrs).

1. Design will be based on strength specimens molded in accordance with ASTM D558 at moisture content within three percent (3%) above or below of optimum moisture content and within four hours (4 Hrs) of batching.

2. Determine minimum cement content from production data and statistical history. Provide no less than one and one tenth (1.1) sacks of cement per ton of dry sand.

PART II: PRODUCTS

2.1 MATERIALS

A. Cement: Type I Portland cement conforming to ASTM C150.

B. Sand: Clean, durable sand meeting grading requirements for fine aggregates of ASTM C33 or requirements for bank run sand of Section 02140 Utility Backfill Materials and the following requirements:

1. Classified as SW, SP, SW-SM, SP-SM or SM by Unified Soil Classification System of ASTM D2487.

2. Deleterious materials:

a. Clay lumps, ASTM C142 less than one-half percent (1/2%).

b. Lightweight pieces, ASTM C123; less than five percent (5%).

c. Organic impurities, ASTM C40, color no darker than standard color.

3. Plasticity index of four (4) or less when tested in accordance with ASTM D4318.

C. Water: Potable water, free of oils, acids, alkalies, organic matter or

other deleterious substances, meeting requirements of ASTM C94.

2.2 MIXING MATERIALS

A. Add required amount of water and mix thoroughly in pugmill-type mixer.

B. Stamp batch ticket at plant with time of loading. Reject material not placed and compacted within four hours (4 Hrs) after mixing.

2.3 MATERIAL QUALIFICATION

A. Determine target cement content of material as follows:

1. Obtain samples of sand-cement mixtures at production facility representing range of cement content consisting of at least three (3) points.

2. Complete molding of samples within four hours (4 Hrs) after addition of water.

3. Perform strength tests [average of two (2) specimens] at forty-eight hours (48 Hrs) and seven days (7 D).

4. Perform cement content tests on each sample.

5. Perform moisture content tests on each sample.

6. Plot average forty-eight hour (48 Hr) strength vs. cement content.

7. Record scale calibration date, sample date, sample time, molding time, cement feed dial settings and silo pressure (if applicable).

B. Test raw sand for following properties at point of entry into pug-mill:

1. Gradation.

2. Plasticity index.

3. Organic impurities.

4. Clay lumps and friable particles.

5. Lightweight pieces.

6. Moisture content.

7. Classification.

C. Present data obtained in format similar to that provided in sample data form attached to this Section.

PART III: EXECUTION

3.1 PLACING

A. Place sand-cement mixture in maximum twelve inch (12 In) thick loose lifts and compact to ninety-five percent (95%) of maximum density as determined in accordance with ASTM D558, unless otherwise specified. Refer to related specifications for thickness of lifts in other applications. Target moisture content during compaction is plus or minus three percent (±3%) of optimum moisture content. Perform and complete compaction of sand-cement mixture within four hours (4 Hrs) after addition of water to mix at plant.

B. Do not place or compact sand-cement mixture in standing or free water.

3.2 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. One (1) sample of cement-stabilized sand shall be obtained for each one hundred fifty tons (150 Tn) of material placed per day with no less than one (1) sample per day of production. Random samples of delivered cement-stabilized sand shall be taken in the field at point of delivery in accordance with ASTM D3665. Obtain three (3) individual samples of approximately twelve pounds (12 Lbs.) to fifteen pounds (15 Lbs.) each from the first (1st), middle and last third (3rd) of the truck and composite them into one sample for test purpose.

C. Prepare and mold four (4) specimens (for each sample obtained) in accordance with ASTM D558, Method A, without adjusting moisture content. Samples shall be molded at approximately same time material is being used, but no later than four hours (4 Hrs) after water is added to mix.

D. After molding, specimens shall be removed from molds and cured in accordance with ASTM D1632.

E. Specimens shall be tested for compressive strength in accordance with ASTM D1633, Method A. Two (2) specimens shall be tested at forty-eight hours (48 Hrs) plus or minus two hours (±2 Hrs) and two (2) specimens shall be tested at seven days (7 D) plus or minus four hours (±4 Hrs).

F. A strength test shall be the average of strengths of two (2) specimens molded from the same sample of material and tested at the same age. The average daily strength shall be the average of strengths of all specimens molded during one day's (1 D) production and tested at same the age.

G. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D1633 Section 9.

H. Reporting: Test reports shall contain, as a minimum, as specified in TABLE 4.1 – CEMENT-STABILIZED SAND REPORT in this section, the following information:

1. Supplier and plant number.
2. Time material was batched.
3. Time material was sampled.
4. Test age (exact hours).
5. Average forty-eight hour (48 Hr) strength.
6. Average seven day (7 D) strength.
7. Technical Specification section number.
8. Indication of compliance / non-compliance.
9. Mixture identification.
10. Truck and ticket numbers.
11. The time of molding.
12. Moisture content at time of molding.
13. Required strength.

14. Test method designations.

15. Compressive strength data as required by ASTM D1633.

16. Supplier mixture identification.

17. Specimen diameter and height, in.

18. Specimen cross-sectional area, sq.in.

3.3 ACCEPTANCE

A. Strength level of material shall be considered satisfactory if:

1. The average forty-eight hour (48 Hr) strength is greater than one hundred pounds per square inch (100 psi) with no individual strength test below seventy pounds per square inch (70 psi).

2. All seven day (7 D) individual strength tests [average of two (2) specimens] are greater than or equal to one hundred pounds per square inch (100 psi).

B. The material shall be considered unacceptable and subject to removal and replacement at the Contractor's expense when individual strength test [average of two (2) specimens) has seven day (7 D) strength] less than one hundred pounds per square inch (100 psi).

C. When the moving average of three (3) daily forty-eight hour (48 Hr) averages falls below one hundred pounds per square inch (100 psi), discontinue shipment to project until plant is capable of producing material, which exceeds one hundred pounds per square inch (100 psi) at forty hours (48 Hrs). Five (5) forty eight hour (48 Hr) strength tests shall be made in this determination with no individual strength tests less than one hundred one hundred pounds per square inch (100 psi).

D. The Testing laboratory shall notify the Contractor, the Project Manager and the material supplier of tests by facsimile indicating results falling below specified strength requirements within twenty-four hours (24 Hrs).

E. If any strength test of laboratory cured specimens falls below the specified strength, the Contractor may, at his own expense, request testing of cores drilled from the area(s) in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in paragraph 3.3.A.

F. Cement-stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least one hundred pounds per square inch (100 psi). Additional testing of cores extracted from locations represented by erratic core strength results shall be permitted.

PART IV: TABLES

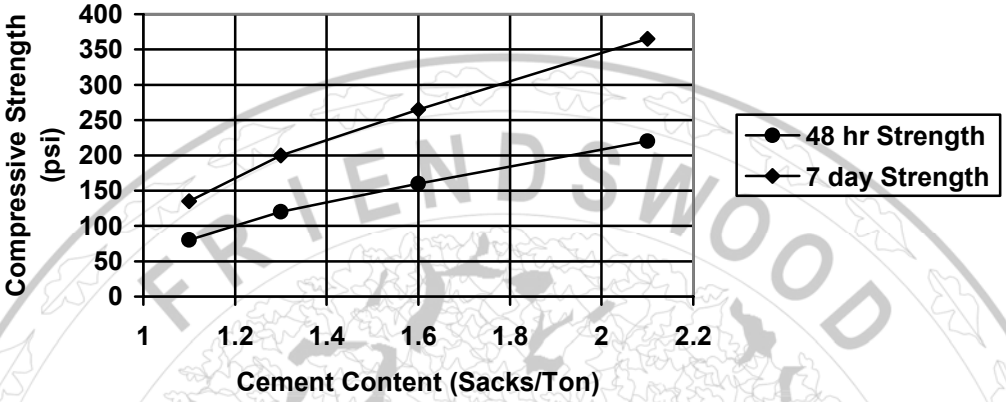
4.1 CEMENT-STABILIZED SAND REPORT

Supplier: Stabilized Sand Co.	**Plant No.:** 3 □ Friendswood		**Date of Tests:** June 3, 2005		
Item	Raw Sand	1.1 Sack	100 psi	1.5 Sack	2.0 Sack
Moisture Content	10.9	15.7	14.0	13.8	13.7
Cement Feed Dial Setting	--	2.25	2.5	2.75	3.75
Silo Pressure (psi)	--	4	4	4	4
Batch Time	10:00	10:10	10:15	10:20	10:25
Sample Time	--	10:10	10:15	10:20	10:25
Molding Time	--	12:30	12:45	1:00	1:15
Cement Content (sacks/ton)	--	1.1	1.3	1.6	2.1
Compressive Strength as 48 hrs (avg of 2)	--	80	120	160	220
Compressive Strength at 7 days (avg of 2)	--	135	200	265	365

Sieve Size	**Percent Passing**	**COF Spec. Section 02140**
3/8 Inch	100%	100%
No. 200	30%	30%

Raw Sand Tests	**Result**	**City of Friendswood**
Plasticity Index	Non-Plastic	4 Maximum
Organic Impurities	Passing	No Darker Than
Clay Lumps & Friable Parts (%)	0.0	0.5 % Maximum
Lightweight Pieces (%)	0.0	5.0 % Maximum
Classification	SP □ SM	SW, SP, SW-SM, SP-SM, SM

Compressive Strength vs Cement Content



END OF SECTION

SECTION 02210

CORRUGATED METAL PIPE (CMP)

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Corrugated metal pipe (CMP).

B. Corrugated metal pipe with smooth interior (CMPSI).

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for corrugated metal pipe in open cut under this Section. Include payment in the unit price for Section 02600 Storm Sewers.

2. No separate payment will be made for corrugated metal pipe in non-open cut under this Section. Include payment in the unit price for applicable tunneling section.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO American Association of State Highway and Transportation Officials.

1. AASHTO M36 Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.

2. AASHTO M 90 Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.

3. AASHTO M196 Corrugated Aluminum Pipe for Sewers and Drains.

4. AASHTO M197 – Aluminum Alloy Sheet for Corrugated Aluminum Pipe.

5. AASHTO M218 – Steel Sheet, Zinc Coated (Galvanized) for Corrugated Steel Pipe.

6. AASHTO M232 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. AASHTO M245 – Corrugated Steel Pipe, Polymer Precoated, for Sewers and Drains.

8. AASHTO M246 – Steel Sheet, Metallic-Coated and Polymer Precoated for Corrugated Steel Pipe.

9. AASHTO M274 – Steel Sheet, Aluminum-Coated (Type 2) for Corrugated Steel Pipe.

B. ASTM – American Society for Testing and Materials.

1. ASTM B633 – Standard Specification for Electro deposited Coatings of Zinc on Iron and Steel.

2. ASTM A760 – Standard Specifications for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.

C. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02125 – Excavation and Backfill for Utilities.

4. Section 02600 – Storm Sewers.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit shop drawings with following information:

1. Design dimensions and details for pipe and fittings indicating alignment, grade and laying dimensions.

2. Fabrication details, details of fittings and flanges, details of specials and proposed welding procedures.

3. Show station numbers for pipe and fittings corresponding to the Drawings.

1.5 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that pipe was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 PIPE AND FITTINGS

A. Corrugated metal pipe may be galvanized steel, aluminized steel, aluminum or precoated galvanized steel as indicated on the Drawings and conforming to TABLE 4.1 AASHTO STANDARDS in this Section.

1. Reference to gauge of metal is to U.S. Standard Gauge for uncoated sheets. Tables in AASHTO M218 and AASHTO M274 list thicknesses for coated sheets in inches. Tables in AASHTO M197 list thicknesses in inches for clad aluminum sheets.

B. Coupling bands and other hardware for galvanized or aluminized steel pipe shall conform to requirements of AASHTO M36 for steel pipe and AASHTO M196 for aluminum pipe.

1. Coupling bands shall be not more than three (3) nominal sheet thicknesses lighter than thickness of pipe to be connected and in no case lighter than fifty-two thousandths inch (0.052 In) for steel or forty-eight thousandths inch (0.048 In) for aluminum.

2. Coupling bands shall be made of same base metal and coating (metallic or otherwise) as pipe.

3. Minimum width of corrugated locking bands shall be as shown below for corrugations which correspond to end circumferential corrugations on pipes being joined:

a. Ten and one-half inches (10-1/2 In) wide for two and two-thirds inch by one-half inch (2-2/3 In x 1/2 In) corrugations.

b. Twelve inches (12 In) wide for three inch by one inch (3

In x 1 In) corrugations.

4. Helical pipe without circumferential end corrugations shall be permitted only when it is necessary to join new pipe to existing pipe which was installed with no circumferential end corrugations. In this event pipe furnished with helical corrugations at ends shall be field jointed with either helically corrugated bands or with bands with projections (dimples). Minimum width of helical corrugated bands shall conform to following:

   a. Twelve inches (12 In) wide for one-half inch (1/2 In) deep helical end corrugations.

   b. Fourteen inches (14 In) wide for one inch (1 In) deep helical end corrugations.

5. Bands with projections shall have circumferential rows of projections with one (1) projection for each corrugation. Width of bands with projections shall be not less than following:

   a. Twelve inches (12 In) wide for pipe diameters up to and including seventy-two inches (72 In). Bands shall have two (2) circumferential rows of projections.

   b. Sixteen and one-quarter inches (16-1/4 In) wide for pipe diameters of seventy-eight inches (78 In) and greater. Bands shall have four (4) circumferential rows of projections.

6. Bolts for coupling bands shall be one-half inch (1/2 In) diameter. Bands twelve inches (12 In) wide or less shall have minimum of two (2) bolts per end at each connection and bands greater than twelve inches (12 In) wide shall have minimum of three (3) bolts at each connection.

7. Galvanized bolts may be hot dip galvanized in accordance with requirements of AASHTO M232, mechanically galvanized to provide same requirements as AASHTO M232 or electro galvanized per ASTM B633, Type RS.

C. Coat bituminous coated pipe or pipe arch inside and out with bituminous coating which shall meet these performance requirements and requirements of AASHTO M190.

   1. Uniformly coat pipe inside and out to minimum thickness of five

hundredths inch (0.05 In), measured on crests of corrugations.

2. Adhere bituminous coating to metal so that it shall not chip, crack or peel during handling and placement; and to protect pipe from corrosion and deterioration.

3. Where paved invert is shown on the Drawings, pipe or pipe arch, in addition to fully-coated treatment described above, shall receive additional bituminous material, same as specified above, applied to bottom quarter of circumference to form smooth pavement. Maintain minimum thickness of one-eight inch (1/8 In) above crests of corrugations.

D. Furnish fittings and specials required for bends, end sections, branches, access manholes and connections to other fittings. Design fittings and specials in accordance with the Drawings and ASTM A760. Fittings and specials are subject to same internal and external loads as straight pipe.

2.2 PIPE FABRICATION

A. Steel Pipe:

1. Galvanized or aluminized steel pipe shall be full circle or arch pipe conforming to AASHTO M36, Type I, Type IA or Type II, as indicated on the Drawings.

2. Fabrication with circumferential corrugations, lap joint construction with riveted or spotwelded seams, helical corrugations with continuous helical lock seam or ultra-high frequency resistance butt-welded seams is acceptable.

B. Aluminum Pipe:

1. Conform to requirements of AASHTO M196, Type I, Type IA, circular pipe or Type II, pipe arch as indicated on the Drawings.

2. Fabrication with circumferential corrugations, lap joint construction with riveted or spotwelded seams or helical corrugations with continuous helical lock seam.

3. Portions of aluminum pipe that is to be in contact with concrete or metal other than aluminum shall be insulated from these materials with coating of bituminous material meeting requirements of AASHTO M190. Extend coating minimum distance of one foot (1 Ft) beyond area of contact.

C. Precoated Galvanized Steel Pipe:

1. Pipe shall be full circle or arch pipe conforming to AASHTO M245, Type I, Type IA or Type II as indicated on the Drawings.

2. Fabrication with circumferential corrugations, lap joint construction with riveted seams or helical lock seams is acceptable.

3. Inside and outside coating shall be minimum of ten (10) mils.

PART III: EXECUTION

3.1 PREPARATION

A. Repair damaged spelter coating by thoroughly wire brushing damaged area and removing all loose, cracked or weld-burned spelter coating. Paint cleaned area with zinc dust-zinc oxide paint conforming to Federal Specifications TT-P-641g.

B. Repair damaged aluminized or polymer coating in accordance with manufacturer's recommendations.

3.2 EARTHWORK

A. Excavate in accordance with requirements of Section 02125 – Excavation and Backfill for Utilities, except where tunneling or jacking methods are shown on the Drawings. When pipes are laid in trench, trench when completed and shaped to receive pipe, shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of backfill and bedding material under and around pipe.

B. Bed pipe in accordance with the Drawings. When requested by the Project Manager, furnish simple template for each size and shape of pipe for use in checking shaping of bedding. Template shall consist of thin plate or board cut to match lower half of cross section.

C. Where rock in either ledge or boulder form exists below pipe, remove rock below grade and replace with suitable materials so slightly yielding compacted earth cushion is provided below pipe minimum of twelve inches (12 In) thick.

D. Remove and replace where soil encountered at established grade is quicksand, muck or similar unstable materials in accordance with

requirements of Section 02125 Excavation and Backfill for Utilities. Do not allow cement stabilized materials for backfill to come into contact with uncoated aluminum or aluminized pipe surface.

E. After metal pipe structure has been completely assembled on proper line and grade and headwalls constructed when required by drawing details, place selected material from excavation or borrow along both sides of completed structures equally, in uniform layers not exceeding six inches (6 In) in depth (loose measurement), wetted when required and thoroughly compacted between adjacent structures and between structure and sides of trench or for distance each side of structure equal to diameter of pipe. Compact backfill material to same density requirements as specified for adjoining sections of embankment in accordance with the specifications. Above three-fourths (3/4) point of structure, place uniformly on each side of pipe in layers not to exceed twelve inches (12 In).

F. Only hand operated tamping equipment shall be allowed within vertical planes two feet (2 Ft) beyond horizontal projection of outside surface of structure for backfilling, until minimum cover of twelve inches (12 In) is obtained. Remove and replace damaged pipe.

G. Do not permit heavy earth moving equipment to haul over structure until minimum of four feet (4 Ft) of permanent or temporary compacted fill has been placed.

H. During backfilling, obtain uniform backfill material and uniform compacted density throughout length of structure to avoid unequal pressure. Provide proper backfill under structure.

I. Prior to adding each new layer of loose backfill material, inspection shall be made of inside periphery of structure for local or unequal deformation caused by improper construction methods. Evidence of deformation shall be reason for corrective measures as may be directed by the Project Manager.

3.3 PIPING INSTALLATION

A. Place pipes on prepared foundation starting at outlet end. Join sections firmly together, with side laps or circumferential joints pointing upstream and with longitudinal laps on sides.

B. Coat metal in joints not protected by galvanizing or aluminizing with approved asphaltum paint.

C. Provide proper equipment for hoisting and lowering sections of pipe into

trench without damaging pipe or disturbing prepared foundation and sides of trench. Take up and re-lay pipe which is not in alignment or which shows undue settlement after laying or is damaged.

D. Lay multiple installations of corrugated metal pipe and pipe arches with center lines of individual barrels parallel. Unless otherwise indicated on the Drawings, maintain following clear distances between outer surfaces of adjacent pipes as specified in TABLE 4.2 PIPE CLEARANCE DISTANCES in this Section.

E. Where extensions are attached to existing structures, install proper connection between structure and existing as indicated on the Drawings, coat connection with bituminous material when required.

F. When existing headwalls and aprons are indicated for reuse on the Drawings, sever portion to be reused from existing culvert and relocate to prepared position. Restore damaged headwalls, aprons or pipes attached to headwall to their original condition.

3.4 JOINTING

A. Use field joints to maintain pipe alignment during construction and prevent infiltration of side material.

B. Lap coupling bands equally on pipes being connected to form tightly-closed joint.

C. Use corrugated locking bands to field join pipes furnished with circumferential corrugations including pipe with helical corrugations having reformed circumferential corrugations on ends. Fit locking bands into minimum of one (1) full circumferential corrugation of pipe ends being coupled.

PART IV: TABLES

4.1 AASHTO STANDARDS

Corrugated Metal Pipe Type	AASHTO Standard
Galvanized Steel	AASHTO M218
Aluminized Steel	AASHTO M274
Aluminum	AASHTO M197
Precoated Galvanized Steel	AASHTO M246

4.2 PIPE CLEARANCE DISTANCES

Diameter of Pipe	Clear Distance Between Pipes Full Circle and Pipe Arch	Pipe Arch Design No.
18□	1' □2□	2
24□	1' □5□	3
30□	1' □8□	4
36□	1' □11□	5
42□	2' □2□	6
48□	2' □5□	7
54□	2' □10□	5
60□□84□	3' □2□	9
90□□120□	3' □5□	10 & Over

END OF SECTION

SECTION 02215

DUCTILE IRON PIPE (DIP) AND FITTINGS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Ductile Iron Pipe (DIP) and fittings for water lines, wastewater force mains, gravity sanitary sewers and storm sewers.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for Ductile Iron Pipe (DIP) and fittings under this Section, with the exception of extra fittings in place. Include cost in unit prices for work as specified in the following Sections, as applicable:

   a. Section 02400 – Water Lines.

   b. Section 02500 – Gravity Sanitary Sewers.

   c. Section 02510 – Sanitary Sewer Force Mains.

   d. Section 02600 – Storm Sewers.

2. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Extra Ductile Iron Pipe (DIP) Compact Fittings in Place shall be for additional fittings required to complete job. This is not to exclude extension of pipe across driveway or intersection for purpose of terminating line in more advantageous position. This determination shall be at discretion of the Project Manager. This bid item includes additional fittings as may be necessary to complete job in conformance with intent of the Drawings.

C. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO – American Association of State Highway and Transportation Officials.

B. AREMA – American Railway Engineering and Maintenance-of-Way Association.

1. Manual for Railway Engineering.

C. ANSI – American National Standards Institute.

1. ANSI A21.4 (AWWA C104) – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings, for Water.

2. ANSI A21.10 (AWWA C110) – Standard for Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in.

3. ANSI A21.11 (AWWA C111) – Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

4. ANSI A21.15 (AWWA C115) – Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.

5. ANSI A21.16 (AWWA C116) – Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey iron Fittings for Water Supply Service.

6. ANSI A21.50 (AWWA C150) – Standard for Thickness Design of Ductile-Iron Pipe.

7. ANSI A21.51 (AWWA C151) – Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids.

8. ANSI A21.53 (AWWA C153) – Standard for Ductile Iron Compact Fittings, 3 inches through 24 inches and 54 inches through 64 inches for Water Service.

D. ASME – American Society of Mechanical Engineers.

1. ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

E. ASTM – American Society for Testing and Materials.

1. ASTM D1248 – Standard Specification Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable.

2. ASTM F477 – Elastomeric Seals (gaskets) for Joining Plastic Pipe.

3. ASTM G62 – Standard Test Methods for Holiday Detection in Pipeline Coatings.

F. AWWA – American Water Works Association.

1. AWWA C102 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

2. AWWA C300 – Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and other Liquids.

3. AWWA C600 – Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

G. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02250 – Steel Pipe and Fittings.

4. Section 02255 – Steel Pipe and Fittings for Large Diameter Water Lines.

5. Section 02260 – Polyethylene Wrap.

6. Section 02265 – Polyurethane Coatings on Steel or Ductile Iron Pipe.

7. Section 02285 – Cathodic Protection.

8. Section 02400 – Water Lines.

9. Section 02450 – Hydrostatic Testing of Waterlines.

10. Section 02500 – Gravity Sanitary Sewers.

11. Section 02510 – Sanitary Sewer Force Mains.

12. Section 02540 – Sanitary Sewer Point Repairs.

13. Section 02560 – Sanitary Sewer Obstruction Removal.

14. Section 02600 – Storm Sewers.

H. SSPC – Steel Structures Painting Council.

1. SSPC-SP 6 – Steel Structures Painting Council, Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. For pipes sixteen inches (16 In) and greater submit shop drawings signed and sealed by a Professional Engineer registered in the State of Texas showing the following:

1. Manufacturer's pipe design calculations

2. Lay schedule of pictorial nature indicating alignment and grade, laying dimensions, fitting, flange and special details, with plan view of each pipe segment sketched, detailing pipe invert elevations, horizontal bends, restrained joints and other critical features. Indicate station numbers for pipe and fittings corresponding to the Drawings. Do not start production of pipe and fittings prior to review and approval by the Project Manager. Provide final approved lay schedule on CD-ROM in Adobe portable document format (*.PDF).

3. Calculations and limits of thrust restraint

4. Class and length of joint

C. Submit manufacturer's certifications that Ductile Iron Pipe (DIP) and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A21.51.

D. Submit certifications that pipe joints have been tested and meet requirements of ANSI A21.11.

E. Submit affidavit of compliance in accordance with ANSI A21.16 for fittings with fusion bonded epoxy coatings or linings.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that pipe was manufactured in

compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 DUCTILE IRON PIPE (DIP)

A. Ductile Iron Pipe (DIP) Barrels: ANSI A21.15, ANSI A21.50 or ANSI A21.51; bear mark of Underwriters' Laboratories approval; minimum thickness Class 51 for water lines and thickness Class 52 for sanitary sewers or as shown on the Drawings. Provide minimum thickness Class 53 for flanged pipe.

B. Provide pipe sections in standard lengths, not less than eighteen feet (18 Ft) long, except for special fittings and closure sections as indicated on shop drawings.

C. Modify pipe for cathodic protection in accordance with Section 02285 – Cathodic Protection. In lieu of furnishing Ductile Iron Pipe (DIP) with cathodic protection system, furnish Ductile Iron Pipe (DIP) with polyethylene encasement, provided the following criteria is met:

1. Provide minimum thickness class

2. Provide polyethylene encasement material and installation in accordance with AWWA C105 and backfill as specified. Minimum of two (2) complete wraps of eight (8) mil thick polyethylene.

3. Use polyethylene encasement for open cut installations only. For augered sections or sections installed inside a casing, provide coating in accordance with paragraph 2.5.D.1.

4. Adhere to other requirements specified herein (e.g., insulation kits, etc.).

D. For use of pressure class pipe for water lines, design pipe and fittings to withstand most critical simultaneous application of external loads and internal pressures. Base design on minimum of AASHTO HS-20 loading, AREMA E-80 loads and depths of bury as indicated on the Drawings. Design pipes with Marston's earth loads for a transition width trench for zero feet (0 Ft) to sixteen feet (16 Ft) of cover. Use Marston's earth loads for a trench width of O.D. (of pipe) plus four feet (+4 Ft) for pipe greater than sixteen feet (16 Ft) of cover. Use Marston's equations for a trench condition in both open-cut and tunnel applications. Design for most critical groundwater level condition. Pipe

design conditions:

1. Working pressure = One hundred pounds per square inch (100 psi).

2. Hydrostatic field test pressure = One hundred fifty pounds per square inch (150 psi).

3. Maximum pressure due to surge = One hundred fifty pounds per square inch (150 psi).

4. Minimum Pressure due to surge = Minus five pounds per square inch (-5 psi).

5. Design tensile stress due to surge or hydrostatic test pressure: No greater than fifty percent (50%) minimum yield.

6. Design bending stress due to combined earth loads and surge or hydrostatic test pressure: No greater than forty-eight thousand pounds per square inch (48,000 psi).

7. Unit weight of fill ≥ One hundred twenty pounds per cubic foot (120 pcf).

8. Deflection lag factor (D_l) = One and two tenths (1.2).

9. Bedding constant (K) = One tenth (0.1).

10. Moment coefficient = Sixteen hundredths (0.16).

11. Fully saturated soil conditions hw=h=depth of cover above top of pipe.

E. Hydrostatic Test of Pipe: AWWA C151, Section 5.2.1, at point of manufacture. Hold test for a minimum two minutes (2 Min) for thorough inspection of pipe. Repair or reject pipe revealing leaks or cracks.

F. Pipe Manufacturer for large diameter water lines: Minimum of five years (5 Yrs) of successful pipe installations in continuous service. Manufacturer must maintain on site or in plant enough fittings to satisfy the requirements as specified in TABLE 4.1 – REQUIRED BENDS in this Section.

Manufacturer or supplier must be capable of delivering bends to job site within twelve hours (12 Hrs) of notification. Use fittings at direction of the Project Manager where unforeseen obstacles are encountered

during construction. These fittings are in addition to any fittings called out in construction documents and must be available at all times.

G. Provide flange adapter with insulating kit as required when connecting new piping to existing piping and piping of different materials, unless otherwise approved by the Project Manager.

H. Clearly mark pipe section to show location and thickness/pressure class color coded.

2.2 JOINTS

A. Joint Types: ANSI A21.11 push-on; ANSI A21.11 mechanical joint; or ANSI A21.16 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, conform to requirements of AWWA C111; provide minimum 304 stainless steel for restraint joints.

B. Where required by the Drawings, provide approved restrained joints for buried service.

C. Threaded or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

D. Provide for restrained joints designed to meet test pressures required under Section 02450 – Hydrostatic Testing of Waterlines or Section 02510 – Sanitary Sewer Force Mains, as applicable. Provide restrained joints for test pressure or maximum surge pressure as specified, whichever is greater for water lines. Do not use passive resistance of soil in determining minimum restraint lengths.

E. Bond rubber gasketed joints to provide electrical continuity along entire pipeline, except where insulating flanges are required by the Drawings.

F. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer for pipe joints or restraint joints. Submit details of other methods of providing curves and bends for consideration by the Project Manager. When other methods are deemed satisfactory, install at no additional cost to the City.

2.3 GASKETS

A. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material in accordance with ANSI A21.11 or ASTM F477 (One Bolt only); for flanged joints one-eight inch (1/8 In) thick gasket in accordance with ANSI A21.15.

2.4 FITTINGS

A. 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. Line and coat fittings as specified for pipe they connect to.

B. Push-on Fittings: ANSI A21.10; Ductile Iron Pipe (DIP) ANSI A21.11 joints, gaskets and lubricants; pressure rated at two hundred pounds per square inch (250 psi).

C. Flanged Fittings: ANSI A21.10; Ductile Iron Pipe (DIP) ANSI A21.11 joints, gaskets and lubricants; pressure rated at two hundred fifty pounds per square inch (250 psi).

D. Mechanical Joint Fittings: ANSI A21.11; pressure rated at two hundred fifty pounds per square inch (250 psi).

E. Ductile Iron Pipe (DIP) Compact Fittings for Water lines: ANSI A21.53; four inch (4 In) through twelve inch (12 In) diameter fusion bonded epoxy-lined or cement mortar lining.

2.5 COATINGS AND LININGS

A. Water line Interiors: ANSI A21.4, cement lined with seal coat; ANSI A21.16 fusion bonded epoxy coating for interior; comply with NSF 61.

B. Sanitary Sewer and Force Main Interiors:

1. Preparation: Commercial blast cleaning conforming to SSPC-SP6.

2. Liner thickness: Nominal forty (40) mils, for pipe barrel interior; minimum six (6) mils to ten (10) mils at gasket groove and outside spigot end to six inches (6 In) back from end.

3. Testing: ASTM G62, Method B for voids and holidays; provide written certification.

4. Acceptable Lining Materials:

a. Provide approved virgin polyethylene conforming to ASTM D1248, with inert fillers and carbon black to resist ultraviolet degradation during storage; heat

bonded to interior surface of pipe and fittings.

b. Ceramic Epoxy – Protecto 401

C. Sanitary Sewer Point Repair Pipe: For pipes which will be lined with high density polyethylene liner pipe or cured-in-place liner, provide cement-lined with seal coat in accordance with ANSI A21.4. For pipes which will not be provided with named liner, provide pipe as specified in Paragraph 2.5.B.4, Sanitary Sewer and Force Main Interiors.

D. Exterior:

1. Water Lines:

a. Auger Holes: Conform to requirements of Section 02265 – Polyurethane Coatings on Steel or Ductile Iron Pipe.

b. Above Ground (or Exposed): Conform to requirements of Section 02250 – Steel Pipe and Fittings, Paragraph 2.3.

c. Tunnel, Casing or Direct Bury: Conform to requirements of Paragraph 2.5.E.

2. Sanitary Sewers: Prime coat and outside asphaltic coating conforming to ANSI A21.10, ANSI A21.15 or ANSI A21.51 for pipe and fittings in open cut excavation and in casings.

E. Polyethylene Wrap: For buried pipes not cathodically protected, provide polyethylene wrap unless otherwise specified or shown. Conform to requirements of Section 02260 – Polyethylene Wrap.

F. 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. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer for maximum resistance to the contaminants identified in the Phase II Environmental Site Assessment Report.

H. For water lines cathodically protected, supply Ductile Iron Pipe (DIP) with either tape coatings or some other bonded dielectric coating as specified in Section 02255 – Steel Pipe and Fittings for Large Diameter Water Lines.

PART III: EXECUTION

3.1 INSTALLATION

A. Conform to installation requirements of Sections 02400 – Water Lines, 02500 – Gravity Sanitary Sewers, 02510 – Sanitary Sewer Force Mains 02600 – Storm Sewers, 02540 – Sanitary Sewer Point Repairs and 02560 – Sanitary Sewer Obstruction Removal, except as modified in this Section.

B. Install in accordance with AWWA C600 and manufacturer's recommendations.

C. Install all Ductile Iron Pipe (DIP) in double polyethylene wrap, unless cathodic protection is provided. Do not use polyethylene wrap with a cathodic protection system.

D. Holiday Testing:

1. Polyurethane: Conform to requirements of Section 02265 – Polyurethane Coatings for Steel or Ductile Iron Pipe.

2. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A 21.16.

3.2 FIELD REPAIR OF COATINGS

A. Polyurethane: Conform to requirements of Section 02265 – Polyurethane Coatings for Steel or Ductile Iron Pipe.

B. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A 21.16.

PART IV: TABLES

4.1 – REQUIRED BENDS

Line Diameter	Required Bends*
20 and 24 inches	Four 45° bends per 5,000 LF of water line
> 24 inches	Four 22.5° bends per 10,000 LF of water line

*Based on total length of contract [minimum of four (4)]. Any combination of bends may be substituted at manufacturer's option [i.e. two (2) – twenty-two and one half degree (22.5°) bends are equivalent to one (1) – forty-five degree (45°) bend] and shall be counted as one (1) fitting.

END OF SECTION

SECTION 02230

POLYETHYLENE PLASTIC TUBING (PE)

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Polyethylene (PE) tubing for water service lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for Polyethylene (PE) tubing under this Section. Include cost in the unit prices for work, as specified in following sections:

   a. Section 02430 Water Tap and Service Line Installation.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA American Water Works Association.

1. AWWA C901 Standard for Polyethylene (PE) Pressure Pipe and Tubing for Water Service.

B. ASTM American Society for Testing and Materials.

1. ASTM D2737 Standard Specification for Polyethylene (PE) Tubing.

2. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02400 Water Lines.

5. Section 02430 Water Tap and Service Line Installation.

6. Section 02455 Disinfection of Waterlines.

7. Section 02460 Wet Connections.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit shop drawings showing design of pipe and fittings, laying dimensions, fabrication, fittings, flanges and special details.

1.5 QUALITY CONTROL

A. Provide manufacturer s certificate of conformance to the Technical Specifications.

B. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density and other physical properties.

C. The Project Manager reserves the right to inspect pipes or witness pipe manufacturing. Inspection shall in no way relieve manufacturer of responsibilities to provide products that comply with applicable standards and these Technical Specifications.

1. Manufacturer s Notification: Should the Project Manager wish to witness manufacture of specific pipes, manufacturer shall provide the Project Manager with minimum three weeks (3 Wks) notice of when and where production of those specific pipes shall take place.

2. Failure to Inspect: Approval of products or tests shall not be implied by the Project Manager s decision not to inspect

manufacturing, testing or finished pipes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with documented experience of a minimum five years (5 Yrs) of pipe installations that have been in successful, continuous service for same type of service as the proposed Work.

PART II: PRODUCTS

2.1 GENERAL

A. All polyethylene (PE) tubing shall be high density, high molecular weight plastic tubing meeting.

B. Polyethylene (PE) tubing for water services shall be pressure rated at two hundred pounds per square inch (200 psi) working pressure and must bear the National Sanitation Foundation seal of approval.

C. Pipe manufacturers shall be listed on SPL WW-65.

D. Polyethylene (PE) tubing shall be designated PE3408, denoting Grade 34 with hydrostatic design stress of eight hundred pounds per square inch (800 psi).

2.2 MARKING

A. Mark each standard and random length of pipe in compliance with these Technical Specifications with following information:

1. Nominal tubing size.

2. Standard PE code designation.

3. Standard Dimension Ratio (SDR) and pressure rating.

4. AWWA designation.

5. Manufacturer Name or Trademark and testing agency name or seal.

PART III: EXECUTION

3.1 INSTALLATION

A. Conform to requirements of following Sections:

1. Section 02125 Excavation and Backfill for Utilities.
2. Section 02400 Water Lines.
3. Section 02430 Water and Tap Service Line Installations.
4. Section 02460 Wet Connections.
5. Section 02455 Disinfection of Waterline.

B. Install pipe in accordance with the manufacturers recommended installation procedures.

C. Polyethylene (PE) tubing is not approved in applications requiring augering of pipe.

D. Bedding and backfill: Conform to requirements of Section 02125 Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02235

POLYVINYL CHLORIDE (PVC) PIPE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Polyvinyl chloride pressure pipe for water distribution, in nominal diameters four inches (4 In) through twenty inches (20 In).

B. Polyvinyl chloride sewer pipe for gravity sewers in nominal diameters four inches (4 In) through forty-eight inches (48 In).

C. Polyvinyl chloride pressure pipe for gravity sewers and force mains in nominal diameters four inches (4 In) through twenty inches (20 In).

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for PVC pipe under this Section. Include cost in the unit price for work included as specified in the following sections:

   a. Section 02400 Water Lines.

   b. Section 02500 Gravity Sanitary Sewers.

   c. Section 02510 Sanitary Sewer Force Mains.

   d. Section 02600 Storm Sewers.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ANSI American National Standards Institute.

1. ANSI A21.16 (AWWA C116) Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply Service.

B. ASTM American Society for Testing and Materials.

1. ASTM D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

2. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

3. ASTM D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

4. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

5. ASTM D2444 Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).

6. ASTM D2680 Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

7. ASTM D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

8. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

9. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

10. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

11. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

12. ASTM F794 □ Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

13. ASTM F949 □ Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.

C. AWWA □ American Water Works Association.

1. AWWA C110 □ American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.

2. AWWA C111 □ American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

3. AWWA C900 □ Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches for Water Distribution.

4. AWWA C905 □ Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., for Water Transmission and Distribution.

5 AWWA C909 □ Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.

D. CTFS □ City of Friendswood Technical Specification.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02125 □ Excavation and Backfill for Utilities.

4. Section 02215 □ Ductile Iron Pipe (DIP) and Fittings.

5. Section 02260 □ Polyethylene Wrap.

6. Section 02400 □ Water Lines.

7. Section 02500 □ Gravity Sanitary Sewers.

8. Section 02510 □ Sanitary Sewer Force Mains.

9. Section 02600 Storm Sewers.

E. PPI Plastic Pipe Institute.

1. PPI TR3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

F. UNI Uni-Bell Standard.

1. UNI-B-13 Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges and special details.

1.5 QUALITY CONTROL

A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C900, AWWA C909 and AWWA C905 for pressure pipe applications or appropriate ASTM standard specified for gravity sewer pipe.

B. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C900, AWWA C909 and AWWA C905 and this Section.

C. When foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory located in United States. Certification from other source is not acceptable. Furnish copies of test reports to the Project Manager for review. Cost of testing paid by the Contractor.

PART II: PRODUCTS

2.1 MATERIAL

A. Use PVC compounds in manufacture of pipe that contain no ingredient

in amount that has been demonstrated to migrate into water in quantities considered to be toxic.

B. Furnish PVC pressure pipe manufactured from Class 12454-A or Class 12454-B virgin PVC compounds as defined in ASTM D1784. Use compounds qualifying for rating of four thousand pounds per square inch (4000 psi) for water at seventy-three and four tenths degrees Fahrenheit (73.4° F) per requirements of PPI TR3. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions and other defects, uniform as commercially practical in color, density and other physical properties. Deliver pipe with surfaces free from nicks and scratches with joining surfaces of spigots and joints free from gouges and imperfections which could cause leakage.

C. PVC Restrained Pipe: Must be listed on the City's current Product Approval List.

1. Pipe Material:

a. DR 18: For restrained joints where shown on Drawings.

b. DR 14: For alternate to offset pipe sections shown on the Drawings. Do not use PVC for offset sections with depth of cover greater than twenty feet (20 Ft) or less than four feet (4 Ft). Do not use PVC in potentially petroleum contaminated areas.

D. Water Service.

1. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to Texas State Fire Insurance Committee for use in fire protection lines.

2. Bear National Sanitation Foundation Seal of Approval (NSF-PW).

E. Gaskets:

1. Gaskets shall meet requirements of ASTM F477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.

2. Flat Face Mating Flange: Full faces one-eighth inch (1/8 In) thick ethylene propylene (EPR) rubber.

3. Raised Face Mating Flange: Flat ring one-eighth inch (1/8 In) ethylene propylene (EDR) rubber, with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.

F. Lubricant for rubber-gasketed joints: Water soluble, non-toxic, non-objectionable in taste and odor imparted to fluid, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.

G. Do not use PVC in potentially or known contaminated areas.

H. Do not use PVC in areas exposed to direct sunlight.

2.2 WATER SERVICE PIPE

A. Pipe four inch (4 In) through twelve inch (12 In): AWWA C900, AWWA C909, Class 150, DR 18; AWWA C900, Class 200, DR 14 as alternate to offset pipe sections; nominal twenty foot (20 Ft) lengths; cast-iron equivalent outside diameters.

B. Pipe fourteen inch (14 In) through twenty inch (20 In): AWWA C905; Class 235; DR 18; nominal twenty foot (20 Ft) lengths; cast-iron equivalent outside diameter.

C. Provide Polyvinyl Chloride Pipe from approved manufacturers.

D. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by the Project Manager.

E. Hydrostatic Test: AWWA C900, AWWA C905, AWWA C909, ANSI A21.10 (AWWA C110); at point of manufacture; submit manufacturer's written certification.

2.3 GRAVITY SEWER PIPE

A. PVC gravity sanitary sewer pipe and storm sewer pipe shall be as specified in TABLE 4.1 PVC PIPE DESIGNATION in the Section.

B. When solid wall PVC pipe eighteen inches (18 In) to twenty-seven inches (27 In) in diameter is required in SDR 26, provide pipe conforming to ASTM F679, except provide wall thickness as required for SDR 26 and pipe strength of one hundred fifteen pounds per square

inch (115 psi).

C. For sewers up to twelve inch (12 In) diameter crossing over water lines or crossing under water lines with less than two feet (2 Ft) separation, provide minimum one hundred fifty pounds per square inch (150 psi) pressure-rated pipe conforming to ASTM D2241 with suitable PVC adapter couplings.

D. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D3212 and ASTM F477 or ASTM D3139 and ASTM F477. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D2444.

E. Fittings: Provide PVC gravity sewer sanitary bends, tee or wye fittings for new sanitary sewer construction. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings shall not be acceptable.

F. Conditioning: Conditioning of samples prior to and during tests is subject to approval by the Project Manager. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D618 at seventy-three and four-tenths degrees Fahrenheit (73.4° F) plus or minus three and six-tenths degrees Fahrenheit (±3.6° F) and fifty percent (50%) relative humidity plus or minus five percent (5%) relative humidity for not less than forty hours (40 Hrs) prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

G. Pipe Stiffness: Determine pipe stiffness at five percent (5%) deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be forty-six pounds per square inch (46 psi). For diameters four inches (4 In) through eighteen inches (18 In), test three (3) specimens, each a minimum of six inches (6 In) in length. For diameters twenty-one inch (21 In) through thirty-six inch (36 In), test three (3) specimens, each a minimum of twelve inch (12 In) in length.

H. Flattening: Flatten three (3) specimens of pipe, prepared in accordance with Paragraph 2.3.F, in suitable press until internal diameter has been reduced to sixty percent (60%) of original inside diameter of pipe. Rate of loading shall be uniform. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking or separation of pipe walls or bracing profiles. Perform the flattening test in conjunction with pipe stiffness test.

I. Joint Tightness: Test for joint tightness in accordance with ASTM D3212, except that joint shall remain watertight at minimum deflection of five percent (5%). Manufacturer shall be required to provide independent third (3rd) party certification for joint testing each diameter of storm sewer pipe.

J. Purpose of Tests: Flattening and pipe stiffness tests are intended to be routine quality control tests. Joint tightness test is intended to qualify pipe to specified level of performance.

2.4 SANITARY SEWER FORCE MAIN PIPE

A. Provide approved PVC pressure pipe conforming to requirements for water service pipe and conforming to minimum working pressure rating specified in Section 02510 Sanitary Sewer Force Mains.

B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F477. In designated areas requiring restrained joint pipe and fittings, use approved joint restraint device conforming to UNI-B-13, for PVC pipe twelve inch (12 In) diameter and less.

C. Fittings: Provide approved ductile iron fittings as per Section 02215 Ductile Iron Pipe (DIP) and Fittings, Paragraph 2.4, except furnish fittings with one (1) of following approved internal linings:

1. Nominal forty (40) mils [thirty-five (35) mils minimum] virgin polyethylene complying with ASTM D1248, heat fused to interior surface of fitting.

2. Nominal forty (40) mils [thirty-five (35) mils minimum] polyurethane.

3. Nominal forty (40) mils [thirty-five (35) mils minimum] ceramic epoxy.

4. Nominal forty (40) mils [thirty-five (35) mils minimum] fusion bonded epoxy.

D. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Section 02260 Polyethylene Wrap.

E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.2.E.

2.5 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum two hundred pounds per square inch (150) psi pressure rating. Approved restrained joints, two hundred pounds per square inch (200 psi) and two hundred fifty pounds per square inch (250 psi), may be provided for up to twelve (12) inches in diameter (water or sanitary).

B. Provide approved restrained joint fittings: Integral restrained joint fittings and pipe shall not require secondary restraint.

PART III: EXECUTION

3.1 PROTECTION

A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with manufacturer's recommendations.

3.2 INSTALLATION

A. Conform to requirements of Section 02400 Water Lines, Section 02500 Gravity Sanitary Sewers and Section 02510 Sanitary Sewer Force Mains, as applicable.

B. Install PVC pipe in accordance with Section 02125 Excavation and Backfill for Utilities, ASTM D2321 for Sewer Pipe and manufacturer's recommendations.

C. Install PVC water service pipe to clear utility lines and have minimum depth of cover below property line grade of street, unless otherwise required by Drawings:

1. Water service pipe twelve (12) inches in diameter and smaller four feet (4 Ft) of cover.

2. Water service pipe sixteen (16) inches in diameter and larger five (5) feet of cover.

D. Avoid imposing strains that shall overstress or buckle pipe when lowering pipe into trench. Do not drop pipe more than two feet (2 Ft).

E. Hand shovel pipe bedding under pipe haunches and along sides of pipe barrel and compact to eliminate voids and ensure side support.

F. Store PVC pipe under cover out of direct sunlight. Protect pipe from excessive heat or harmful chemicals. Prevent damage by crushing or piercing.

G. Allow PVC pipe to cool to ground temperature before backfilling when assembled out of trench to prevent pullout due to thermal contraction.

3.3 PVC RESTRAINED MECHANISM

A. Do not apply lubricant to spline or pipe or coupling spline grooves.

B. Do not use excessive force while inserting the spline through coupling.

C. Insert spline until it is fully seated around circumference of pipe.

D. Field Cutting of Pipe Ends:

1. Perform by workers certified by manufacturer.

2. Use a PVC pipe cutter and provide square ends.

3. Use manufacturer approved power routing and grooving tool to field fabricate required pipe groove.

PART IV: TABLES

4.1 □PVC PIPE DESIGNATION

WALL CONSTRUCTION	MANUFACTURER	ASTM DESIGNATION	SDR (MAX.)/ STIFFNESS (MIN.)	DIAMETER SIZE RANGE
Solid	J-M Pipe	D3034	SDR 26 / PS 115	6□TO 10□
		D3034	SDR 35 / PS 46	12□& 15□
	CertainTeed	F679	SDR 35 / PS 46	18□to 27□
	Diamond	AWWA C900	DR 18 / N/A	4□to 12□
	Uponor ETI	AWWA C909	DR 18 / N/A	4□to 12□
	North American	AWWA C905	DR 18 / N/A	14□to 16□
Truss (Gasketed)	Contech	D2680	N/A / 200 psi	8□to 15□
Profile	Contech A-2000	F949	N/A / 46 psi	12□to 16□
	Contech A-2026	F949	N/A / 115 psi	8□to 10□
	ETI, Ultra-Rib	F794	N/A / 46 psi	8□to 30□
	ETI, Ultra-Corr	F794	N/A / 46 psi	24□to 36□

END OF SECTION

SECTION 02240

REINFORCED CONCRETE BOXES (RCB)

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Precast reinforced concrete box sewers.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for precast reinforced concrete box sewer under this Section. Include payment in the unit price for Section 02600 Storm Sewers.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C1433 Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02600 Storm Sewers.

5. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit shop drawings and data on box sections, fittings, gaskets and appurtenances for approval. Indicate conformance to reference standards.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that pipe was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 PRECAST REINFORCED CONCRETE BOX SEWERS

A. Conform to ASTM C1433, as indicated on the Drawings.

B. Pipe and boxes shall be machine-made or cast by process which shall provide for uniform placement of concrete in forms and compaction by mechanical devices to produce dense, structurally sound concrete.

2.2 CONCRETE

A. Conform to requirements of Section 03300 Structural Concrete.

B. Use concrete mixed in central batch plant or other batching facility from which quality and uniformity of concrete can be assured. Transit-mixed concrete is not acceptable.

2.3 SOURCE QUALITY CONTROL

A. The Project Manager shall inspect manufacturer's plant and casting operations as deemed necessary.

PART III: EXECUTION

3.1 BEDDING

A. Bed box sections on foundation of firm and stable material accurately shaped to conform to their bases. Install bedding as specified in Section 02125 Excavation and Backfill for Utilities. When required by the Drawings, use special bedding material. When single-cell box sections are placed in parallel for multi-cell installation, place in

conformance with details shown on the Drawings.

3.2 PLACEMENT

A. Carefully lower box sections to bottom of trench and lay accurately in line and grade, with spigot or tongue end downstream entering bell or groove end to full depth and in such manner as not to drag foreign material into annular space.

3.3 JOINTING

A. Join box sections together and match so that they shall form continuous smooth and uniform invert.

3.4 BACKFILLING

A. After box has been properly jointed and bedded, commence backfilling.

B. Backfill in accordance with Section 02125 Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02245

REINFORCED CONCRETE PIPE (RCP)

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Reinforced concrete pipe for sanitary sewers and storm sewers.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for reinforced concrete pipe under this Section. Include cost in unit price work as specified in following Sections:

   a. Section 02500 Gravity Sanitary Sewers.

   b. Section 02600 Storm Sewers.

2. Refer to Section 01270- Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

2. ASTM C443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.

3. ASTM C497 Standard Test Method for Concrete Pipe, Manhole Sections or Tile.

4. ASTM C506 Standard Specification for Reinforced Concrete

Arch Culvert, Storm Drain and Sewer Pipe.

5. ASTM C655 □ Standard Specification for Reinforced Concrete D-load Culvert, Storm Drain and Sewer Pipe.

6. ASTM C877 □ Standard Specification for External Sealing Bands for Noncircular Concrete Sewer, Storm Drain and Culvert Pipe.

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02125 □ Excavation and Backfill for Utilities.

4. Section 02500 □ Gravity Sanitary Sewers.

5. Section 02600 □ Storm Sewers.

6. Section 03105 □ Grout.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit complete product data for pipe, fittings and gaskets for approval. Indicate conformance to appropriate reference standards.

C. Submit manufacturer's certificate that concrete pipes meet applicable standards.

D. For jacking pipe, submit drawings and data describing grouting port design and closure procedures when required by Section 03105 □ Grout, including liner repair, as applicable.

1.5 QUALITY ASSURANCE

A. Provide manufacturer□s affidavits that pipe was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 REINFORCED CONCRETE PIPE

A. Conform circular reinforced concrete pipe to requirements of ASTM C76, for Class III wall B thickness. Conform to rubber gasket joints for sanitary sewers and storm sewers and tongue and groove for roadside ditch culverts to ASTM C443.

B. Conform reinforced concrete arch pipe to requirements of ASTM C506 for Class A-III. Joints shall conform to ASTM C877.

C. Reinforced concrete elliptical pipe, either vertical or horizontal, shall conform to requirements of ASTM C507 for Class VE-III for vertical or Class HE-III for horizontal. Use rubber gasket joints conforming to ASTM C877.

D. Conform reinforced concrete D-load pipe requirements of ASTM C655.

2.2 GASKETS

A. When no contaminant is identified, furnish rubber gasket conforming to ASTM C443 for circular reinforced concrete pipe and rubber gasket conforming to ASTM C877 for reinforced concrete elliptical pipe.

B. Pipes allowed to be installed in potentially contaminated areas, where free product is found near elevation of proposed sewer, shall have gasket materials for noted contaminant as specified in TABLE 4.1 GASKET MATERIAL REQUIRED FOR CONTANIMANTS in this Section.

2.3 LINERS FOR SANITARY SEWER PIPE

A. Reinforced concrete pipe for sanitary sewers shall be PVC lined.

B. Reinforced concrete pipes to be installed in potentially contaminated areas shall have liners recommended by manufacturer as resistant to contaminants identified in Phase II Environmental Site Assessment Report.

2.4 SOURCE QUALITY CONTROL

A. The Project Manager shall inspect manufacturer's plant and casting operations as deemed necessary.

PART III: EXECUTION

3.1 BEDDING

A. Bed pipe sections on foundation of firm and stable material accurately shaped to conform to their bases. Install bedding as specified in Section 02125 Excavation and Backfill for Utilities. When required by the Drawings, use special bedding material. When single-cell pipe sections are placed in parallel for multi-cell installation, place in conformance with details shown on the Drawings.

3.2 PLACEMENT

A. Carefully lower pipe sections to bottom of trench and lay accurately in line and grade, with spigot or tongue end downstream entering bell or groove end to full depth and in such manner as not to drag foreign material into annular space.

3.3 JOINTING

A. Join pipe sections together and match so that they shall form continuous smooth and uniform invert.

3.4 BACKFILLING

A. After pipe has been properly jointed and bedded, commence backfilling.

B. Backfill in accordance with Section 02125 Excavation and Backfill for Utilities.

PART IV: TABLES

4.1 GASKET MATERIAL REQUIRED FOR CONTANIMANTS

CONTAMINANT	GASKET MATERIAL REQUIRED
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by pipe manufacturer

END OF SECTION

SECTION 02250

STEEL PIPE AND FITTINGS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Steel pipe and fittings for water lines for aerial crossings, aboveground piping and encasement sleeves.

B. Specifications identify requirements for small-diameter less than or equal to twenty inches (20 In).

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No payment will be made for steel pipe and fittings under this Section. Refer to Section 02400 Water Lines for measurement and payment.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO American Association of State Highway and Transportation Officials.

1. AASHTO Standard Specifications for Highway Bridges.

B. ASME American Society of Mechanical Engineers.

1. ASME B16.1 Cast-Iron Pipe Flanges and Flanged Fittings.

C. ASTM American Society for Testing and Materials.

1. ASTM A36 Standard Specification for Carbon Structural

Steel.

2. ASTM A53 □ Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

3. ASTM A105 □ Standard Specification for Carbon Steel Pipe Forgings for Piping Applications.

4. ASTM A106 □ Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

5. ASTM A135 □ Standard Specification for Electric-Resistance-Welded Steel Pipe.

6. ASTM A139 □ Standard Specification for Electric-Fusion (ARC) □ Welded Steel Pipe (NPS 4 and Over).

7. ASTM A1011 □ Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

8. ASTM D4541 □ Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

D. AWWA □ American Water Works Association.

1. AWWA C200 □ Standard for Steel Water Pipe 6 in. and Larger.

2. AWWA C206 □ Standard for Field Welding of Steel Water Pipe.

3. AWWA C207 □ Standard for Steel Pipe Flanges for Waterworks Service □ Sizes 4 in. through 144 in.

4. AWWA C210 □ Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

5. AWWA M11 □ Steel Pipe □ A Guide for Design and Installation.

E. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02125 □ Excavation and Backfill for Utilities.

4. Section 02400 – Water Lines.

F. SSPC – Steel Structure Painting Council.

1. SSPC Good Painting Practice, Volume 1.

2. SSPC SP1 – Surface Preparation Specification No. 1 Solvent Cleaning.

3. SSPC SP5 – Joint Surface Preparation Standard White Blast Cleaning.

4. SSPC SP6 – Surface Preparation Specification No. 6 Commercial Blast Cleaning.

5. SSPC SP10 – Surface Preparation Specification No. 10 Near-White Blast Cleaning.

6. SSPC VIS1 – Visual Standard for Abrasive Blast Cleaned Steel.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures. For aerial crossings and above ground piping, include lay schedule of new pipe and fittings indicating alignment and grade, laying dimensions, lining and coating systems, proposed welding procedures, fabrication, fitting, flange and special details. Show station numbers for pipe and fittings corresponding to the Drawings.

B. Submit manufacturer's certifications that pipe and fittings are new and unused.

C. Submit manufacturer's certifications that pipe and fittings have been hydrostatically tested at factory in accordance with AWWA C200.

D. Submit manufacturer's affidavits that coatings and linings comply with applicable requirements of this Section and:

1. Polyurethane coatings were applied in strict accordance with manufacturer's recommendation and allowed to cure at temperature five degrees Fahrenheit (5° F) above dew point.

2. Linings were applied and allowed to cure at temperature above thirty-two degrees Fahrenheit (32° F).

E. Submit certification from National Association of Corrosion Engineers (NACE) Certified Coatings Inspector, having Level III certification for coatings and linings, that steel pipe furnished on project was properly inspected and any defective coating detected was properly repaired.

1.5 QUALITY CONTROL

A. Prior to start of work, provide proof of certification of qualification for welders employed for type of work, procedures and positions involved. Provide welder qualifications in accordance with AWWA C206.

B. Shop-applied coatings and linings; provide services of an independent coating and lining inspection service or testing laboratory with qualified coating inspectors. Perform inspection by NACE trained inspectors under supervision of NACE Level III Certified Coatings Inspector verifying compliance with same requirements specified in Paragraph 3.2.

C. Coatings: Measure temperature and dew point of ambient air before applying coatings. Inspect physical dimensions and overall condition of coatings. Inspect for visible surface defects, thickness and adhesion of coating to surface and between layers.

D. Final Inspection:

1. Before shipment, inspect each finished pipe, fitting, special and accessory for markings, metal thickness, coating thickness, lining thickness (if shop applied), joint dimensions and roundness.

2. Inspect for coating placement and defects. Test exterior coating for holidays.

a. Inspect linings for thickness, pitting, scarring and adhesion.

E. Ensure workmen engaged in manufacturing are qualified and experienced in performance of their specific duties.

PART II: PRODUCTS

2.1 STEEL PIPE

A. Manufacture pipe with nominal diameter twenty inches (20 In) and less, but more than two inches (2 In), to conform to ASTM A106 or A 53

Grade B, standard weight.

B. Provide steel pipe and encasement sleeves designed and manufactured in conformance with AWWA C200 and AWWA M11 except as modified herein. Steel to be minimum of A36, ASTM A1011 Grade 36, ASTM A53 Grade B, ASTM A135 Grade B or ASTM A139 Grade B.

C. Minimum Allowable Steel-Wall Thickness shall be as specified in TABLE 4.1 STEEL WALL THICKNESS FOR CARRIER PIPE in this Section.

1. Review pipe and fitting design for conditions exceeding those specified herein.

2. Provide pipe with wall thickness of no less than listed in TABLE 4.1 STEEL WALL THICKNESS FOR CARRIER PIPE in this Section.

D. Minimum Diameter for Casing Pipe shall be as specified in TABLE 4.2 MINIMUM DIAMETER FOR CASING PIPE in this Section.

1. Provide casing pipe with wall thickness of no less than listed in TABLE 4.2 MINIMUM DIAMETER FOR CASING PIPE in this Section.

2. Casing pipe: AWWA C200 new uncoated welded steel.

3. Verify casing diameter required with dimensions of casing spacer.

E. Provide pipe sections in lengths of not less than sixteen feet (16 Ft) except as required for special sections and not greater than forty feet (40 Ft).

F. Provide short sections of steel pipe not less than four feet (4 Ft) in length unless indicated on the Drawings or specifically permitted by the Project Manager.

G. Fittings: Factory forged for sizes two inches (2 In) through twenty inches (20 In); long radius bends; beveled ends for field butt welding; wall thickness equal to or greater than pipe to which fitting is to be welded unless otherwise shown on the Drawings.

H. Joints:

1. Standard field joint for steel pipe and encasement sleeve: AWWA C206. Single-welded, butt joint.

2. Provide mechanically coupled or flanged joints for valves and fittings, as shown on the Drawings. Flanges: AWWA C207, Class D; same diameter and drilling as Class 125 cast iron flanges ASME B16.1. Maintain electrically isolated flanged joints between steel and cast iron by using epoxy-coated bolts, nuts, washers and insulating type gasket.

3. Elbows to be standard weight seamless elbows per ASTM A106, Grade A or B.

4. Flanges for pipe twenty inches (20 In) in diameter and less, but more than two inches (2 In), shall be ANSI one hundred fifty pound (150 Lb) flat face, slip on or weld neck flanges, meeting ASTM A105 requirements. Where flanges are to join to valves with raised face flanges, use ANSI one hundred fifty pound (150 Lb) raised flange.

5. Provide same coating for exposed portions of nuts and bolts as flanges which they secure.

I. Fabricate flanges with over-size bolt holes, with flanges drilled in pairs, to accommodate insulating sleeves.

2.2 INTERNAL LINING SYSTEMS FOR STEEL PIPE, ALL INSTALLATIONS

A. Supply steel pipe with epoxy lining, capable of conveying water at temperatures not greater than one hundred forty degrees Fahrenheit (140° F). Provide linings conforming to American National Standards Institute/National Sanitation Foundation (ANSI/NFS) Standard 61 and certification to be from organization accredited by ANSI. Unless otherwise noted, coat exposed (wetted) steel parts of flanges, blind flanges, bolts, access manhole covers, etc., with epoxy lining, as specified in TABLE 4.3 EPOXY LINING in this Section.

B. Epoxy Lining AWWA C210, White or approved equal for shop and field joint applied, except as modified in this Section. Provide material from same manufacturer. For Pipe larger than two inches (2 In) in diameter protect interior surface with liquid two-part chemically cured epoxy primer specified for interior surfaces.

1. Total allowable dry film thickness for system:

a. Minimum: Twelve (12) mils.

b. Maximum: Eighteen (18) mils.

c. Minimum field adhesion: Seven hundred pounds per square inch (700 psi).

2. Dry film thicknesses for approved alternate products in accordance with product manufacturer s recommendations.

3. Lining system may consist of three (3) or more coats of same approved alternate epoxy lining without use of separate primer.

2.3 EXTERNAL COATING SYSTEM FOR STEEL PIPE INSTALLED ABOVEGROUND AND IN VAULTS (EXPOSED)

A. Provide three (3) coat epoxy/polyurethane coating system as specified in TABLE 4.4 THREE PART EPOXY/POLYURETHANE COATINGS in this Section. Provide material from same manufacturer.

B. Total Allowable Dry Film Thickness (DFT) for System:

1. Minimum: Nine and one-half (9.5) mils

2. Maximum: Twelve and one-half (12.5) mils

C. Clean bare pipe free from mud, mill lacquer, oil, grease or other contaminant. Inspect and clean surfaces according to SSPC SP1 to remove oil, grease and loosely adhering deposits prior to blast cleaning. Remove visible oil and grease spots by solvent wiping. Use only approved safety solvents which do not leave residue. Use preheating to remove oil, grease, mill scale, water and ice provided pipe is preheated in uniform manner to avoid distortion.

D. Remove surface imperfections such as slivers, scabs, burrs, weld spatter and gouges, presence of metallic defects may be cause for rejection of pipe.

PART III: EXECUTION

3.1 PIPING INSTALLATION

A. Conform to applicable provisions of Section 02400 Water Lines, except as modified in this Section.

B. Comply with the following:

1. Bedding and Backfilling: Conform to requirements of Section 02125 Excavation and Backfill for Utilities.

2. For pipes with coating: Do not roll or drag pipe on ground, move pipe in such a manner as not to damage pipe or coating. Carefully inspect pipe for abrasions and repair damaged coating before pipe is installed.

C. Static Electricity:

1. Properly ground steel pipeline during construction as necessary to prevent build-up of static electricity.

2. Electrically test where required after installation is complete.

D. Do not bury steel pipe, unless it is large diameter water line.

3.2 EXTERNAL COATING SYSTEM FOR STEEL PIPE INSTALLED ABOVE GROUND AND IN VAULTS (EXPOSED) AND EPOXY INTERNAL LINING SYSTEM.

A. Safety: Paints, coatings and linings specified in this Section are hazardous materials. Vapors may be toxic or explosive. Protective equipment, approved by appropriate regulatory agency, is mandatory for personnel involved in painting, coating and lining operations.

B. Workmanship:

1. Application: By qualified and experienced workers who are knowledgeable in surface preparation and application of high-performance industrial coatings.

2. Paint Application Procedures: SSPC Good Painting Practices, Volume 1.

C. Surface Preparation:

1. Prepare surfaces for painting by using abrasive blasting.

2. Schedule cleaning and painting so that detrimental amounts of dust or other contaminants do not fall on wet, newly-painted surfaces. Protect surfaces not intended to be painted from effects of cleaning and painting operations.

3. Prior to blasting, clean surfaces to be coated or lined of grease, oil and dirt by steaming or detergent cleaning in accordance with SSPC SP1.

4. Metal and Weld Preparation: Remove surface defects such as gouges, pits, welding and torch-cut slag, welding flux and spatter by grinding to one-quarter inch (1/4 In) minimum radius.

5. Abrasive Material:

   a. Blast only as much steel as can be coated same day of blasting.

   b. Use sharp, angular, properly graded abrasive capable of producing depth of profile specified herein. Transport abrasive to job site in moisture-proof bags or airtight bulk containers. Copper slag abrasives are not acceptable.

   c. After abrasive blast cleaning, verify surface profile with replica tape such as Tes-Tex Coarse or Extra Coarse Press-O-Film Tape or approved equal. Furnish tapes to the Project Manager.

   d. Do not blast if metal surface may become wet before priming commences or when metal surface is less than five degrees Fahrenheit (5° F) above dew point.

6. Evaluate degree of cleanliness for surface preparation with use of Pictorial Surface Preparation Standards for Painting Steel Surfaces, SSPC Vis1.

7. Remove dust and abrasive residue from freshly blasted surfaces by brushing or blowing with clean, dry air. Test cleanliness by placing three-quarters inch by four inch (3/4 In x 4 In) piece of clear Scotch type tape on blasted surface, then removing and placing tape on three inch by five inch (3 In x 5 In) white index card. Re-clean areas exhibiting dust or residue.

D. Coating and Lining Application:

1. Environmental Conditions: Do not apply coatings or linings when metal temperature is less than fifty (50) degrees F; when ambient temperature is less than five degrees Fahrenheit (5° F) above dew point; when expected weather conditions are such

that ambient temperature will drop below forty degrees Fahrenheit (40° F) within six hours (6 Hrs) after application; or when relative humidity is above eighty-five percent (85%). Measure relative humidity and dew point by use of sling psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. Provide dehumidifiers for field-applied coatings and linings to maintain proper humidity levels.

2. Application Procedures:

   a. Apply in accordance with manufacturer's recommendations and requirements of this Section. Provide finish free of runs, sags, curtains, pinholes, orange peel, fish eyes, excessive over spray or delaminations.

   b. Thin materials only with manufacturers recommended thinners. Thin only with an amount required to adjust viscosity for temperature variations, proper atomization and flow-out. Mix material components using mechanical mixers.

   c. Discard catalyzed materials remaining at end of day.

3. Thoroughly dry pipe before primer is applied. Apply primer immediately after cleaning surface. Apply succeeding coats before contamination of undersurface occurs.

4. Cure a minimum of twenty-four hours (24 Hrs) at seventy-seven degrees Fahrenheit (77° F) before successive coats are applied. During curing process, provide force air ventilation in volume sufficient to maintain solvent vapor levels below published threshold limit value. Apply successive coats within recoat threshold time as recommended by coating or lining manufacturer on printed technical data sheets or through written communications. Brush blast joints of pipe which have been shop primed and are to receive intermediate and finish coats in field prior to application of additional coats. After interior coatings are applied, provide forced air ventilation in sufficient volume and for sufficient length of time to ensure proper curing before filling pipe with water.

E. Testing of Coatings and Linings:

1. Inspect pipe for holidays and damage to coating:

a. If test indicates no holidays and coating is damaged, remove deficient or damaged layers of coating and repair in accordance with coating manufacturer's recommendations.

2. Perform holiday test in accordance with NACE Standard Recommended Practice, RPO 188-90, Discontinuity (Holiday) Testing of Protective Coatings.

3. Begin testing of completed coating after coating has sufficiently cured, usually one day (1 D) to five days (5 D). Consult coating manufacturer for specific curing schedule.

4. Perform adhesion test on pipe in accordance with ASTM D4541.

5. For coating thickness of twenty (20) mils or less, test with wet sponge low-voltage holiday detector. For coating thickness in excess of twenty (20) mils, test with high-voltage holiday detector. Perform electrical holiday test with sixty (60) cycle current audio detector. Select test voltage as specified in TABLE 4.5 □ MINIMUM VOLTAGES FOR HIGH VOLTAGE SPARK TESTING in this Section.

3.3 JOINTS AND JOINTING

A. Welded Joints:

1. Conform to requirements of Section 02400 □ Water Lines.

2. Field weld to be full penetration butt welded joints for steel pipe and encasement sleeves for entire circumference.

3. The City shall employ an independent certified testing laboratory to perform weld acceptance tests on welded joints. Testing Laboratory shall test by X-ray methods for butt welds, for 100 percent of joint welds. The Project Manager has final decision as to suitability of welds tested.

B. Flanged Joints: Conform to requirements of Section 02400 □ Water Lines.

C. Joint Grouting and Testing: Conform to requirements of Section 02400 □ Water Lines.

3.4 COATINGS AND LININGS INSPECTION RESPONSIBILITIES

A. Contractor is responsible for quality control of coatings and linings applications and testing and inspection stipulated in this Section. The Project Manager is responsible for quality assurance and reserves the right to inspect or acquire services of an independent third-party inspector who is fully knowledgeable and qualified to inspect surface preparation and application of high-performance coatings at all phases of coatings and linings, work, field- or shop-applied. Contractor is responsible for proper application and performance of coatings and linings whether or not the Project Manager provides such inspection.

PART IV: TABLES

4.1 MINIMUM ALLOWABLE STEEL-WALL THICKNESS

CARRIER PIPE			
Nom. Pipe Size (In.)	Min. Wall		Approx. Wt. Per L.F. Uncoated (Lb.)
	O.D. (In.)	Thick. (In.)	
4	4.50	0.250	11.35
6	6.625	0.280	18.97
8	8.625	0.322	28.55
10	10.75	0.365	40.48
12	12.75	0.375	49.56
16	16.00	0.375	62.58
20	20.00	0.375	78.60

4.2 □MINIMUM DIAMETER FOR CASING PIPE

MINIMUM DIAMETER CASING PIPE (ENCASEMENT SLEEVES)			
Corresp. Casing Pipe Size (In.)	Min. Wall		Approx. Wt. Per L.F. Uncoated (Lb.)
	O.D. (In.)	Thick. (In.)	
8	8.625	0.219	19.64
10	10.75	0.219	24.60
12	12.75	0.219	29.28
16	16.00	0.219	36.86
18	18.00	0.250	47.39
20	20.00	0.250	52.73
24	24.00	0.250	63.41

4.3 EPOXY LINING

Surface Preparation 2.0 to 3.0 mils surface profile	SSPC □5 (64) White Blast Clean
Prime Coat 4.0 to 6.0 mils DFT	NSF Certified Epoxy □Buff or approved Equal
Intermediate Coat 4.0 to 6.0 mils DFT	NSF Certified Epoxy □Buff or approved Equal
Finish Coat 4.0 to 6.0 mils DFT	NSF Certified Epoxy □White or approved Equal

4.4 □THREE PART EPOXY/POLYURETHANE COATINGS

Surface Preparation 2.0 to 3.0 mils surface profile	SSPC SP10 Near White Blast Clean
Prime Coat 4.0 to 6.0 mils DFT	Inhibitive Epoxy Primer or approved equal
Intermediate Coat 4.0 to 6.0 mils DFT	Chemical Resistant Epoxy or approved equal
Finish Coat 1.5 to 2.5 mils DFT	Polyurethane or approved equal Barr Blue Color as approved by the Project Manager

4.5 MINIMUM VOLTAGES FOR HIGH VOLTAGE SPARK TESTING

MINIMUM VOLTAGES FOR HIGH VOLTAGE SPARK TESTING	
Total Dry Film Thickness (mils)	Suggested Inspection (V)
20 to 40	3,000
41 to 55	4,000
56 to 80	6,000

END OF SECTION

SECTION 02260

POLYETHYLENE WRAP

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Polyethylene wrap to be used in open-cut construction for cast iron and ductile iron pipe when cathodic protection system is not required by the Drawings.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for polyethylene wrap. Include cost of polyethylene wrap in the unit price for pipes and fittings to be wrapped.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCE

A. ASTM □ American Society for Testing and Materials.

1. ASTM D1248 □ Standard Specification for Polyethylene Plastics Molding and Extrusion Materials For a Wire and Cable.

B. AWWA □ American Water Works Association.

1. AWWA C105 □ Standard for Polyethylene Encasement for Ductile-Iron Pipe System.

C. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit product data for proposed film and tape for approval.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with Technical Standards referenced in this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Polyethylene Film: Tubular or sheet form without tears, breaks, holidays or defects; conforming with requirements of AWWA C105, two and one-half percent (2-1/2%) to three (3%) percent carbon black content, either low- or high-density:

1. Low-density polyethylene film: Low-density polyethylene film shall be manufactured of virgin polyethylene material conforming to following requirements of ASTM D1248.

a. Raw material.

1) Type : I.

2) Class: C (black).

3) Grade: E-5.

4) Flow rate (formerly melt index): Four tenths gallons per ten minutes (0.4 Gal/10 Min), maximum.

5) Dielectric strength: Volume resistivity, 10_{15} ohm-cm, minimum.

b. Physical properties.

1) Tensile strength: One thousand pounds per square inch (1200 psi), minimum.

2) Elongation: Three hundred percent (300%),

minimum.

3) Dielectric strength: Eight hundred volts per mil (800 V/mil) thickness, minimum.

c. Thickness: Low-density polyethylene film shall have normal thickness of eight thousandths inch (0.008 In). Minus tolerance on thickness is ten percent (-10%) of nominal thickness.

2. High-density, cross-laminated polyethylene film: High-density, cross laminated polyethylene film shall be manufactured of virgin polyethylene material conforming to following requirements of ASTM D1248.

a. Raw material.

1) Type: III.

2) Class: C (black).

3) Grade: P33.

4) Flow rate (formerly melt index): Four tenths Gallon per ten minutes (0.4 Gal/10 Min) to five tenths gallon per ten minutes (0.5 Gal/10 Min), maximum.

5) Dielectric strength: Volume resistivity, 10_{15} ohm-cm, minimum.

b. Physical properties:

1) Tensile strength: Five thousand pounds per square agent (5000 psi), minimum.

2) Elongation: One hundred percent (100%), minimum.

3) Dielectric strength: Eight hundred volts per mil (800 V/mil) thickness, minimum.

c. Thickness: Film shall have nominal thickness of four thousandths inch (0.004 In). Minus tolerance of thickness is ten percent (-10%) of nominal thickness.

B. Polyethylene Tape: Provide three inch (3 In) wide, plastic-backed, adhesive tape; Paleocene No. 900, Scotchwrap No. 50 or approved equal.

PART III: EXECUTION

3.1 PREPARATION

A. Remove lumps of clay, mud and cinders from pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

B. Fit polyethylene film to contour of pipe to affect snug, but not tight fit; encase with minimum space between polyethylene and pipe. Allow sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints or fittings and to prevent damage to polyethylene due to backfilling operations. Secure overlaps and ends with adhesive tape to hold polyethylene encasement in place until backfilling operations are complete.

C. For installations below water table or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.

3.2 INSTALLATION

A. Tubular Type (Method A):

1. Cut polyethylene tube to length approximately two feet (2 Ft) longer than pipe section. Slip tube around pipe, centering tube to provide one foot (1 Ft) overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears pipe ends.

2. Lower pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene tube.

3. After assembling pipe joint, make overlap of polyethylene tube. Pull bunched polyethylene from preceding length of pipe, slip it over end of adjoining length of pipe and secure in place, then slip end of polyethylene from adjoining pipe section over end of first wrap until it overlaps joint at end of preceding length of pipe. Secure overlap in place. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold at quarter points.

4. Repair cuts, tears, punctures or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

B. Tubular Type (Method B):

1. Cut polyethylene tube to length approximately one foot (1 Ft) shorter than pipe section. Slip tube around pipe, centering it to provide six inches (6 In) of bare pipe at each end. Take up slack width at top of pipe to make snug, but not tight, fit along barrel of pipe, securing fold at quarter points; secure ends.

2. Before making up joint, slip three foot (3 Ft) length of polyethylene tube over end of preceding pipe section, bunching in accordion-fashion lengthwise. After completing joint, pull three foot (3 Ft) length of polyethylene over joint, overlapping polyethylene previously placed on each adjacent section of pipe by at least one foot (1 Ft); make each end snug and secure.

3. Repair cuts, tears, punctures or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

C. Sheet Type:

1. Cut polyethylene sheet to length approximately two feet (2 Ft) longer than pipe section. Center length to provide one foot (1 Ft) overlap on each adjacent pipe section, bunching sheet until it clears pipe ends. Wrap polyethylene around pipe so that sheet circumferentially overlaps top quadrant of pipe. Secure cut edge of polyethylene sheet at intervals of approximately three feet (3 Ft).

2. Lower wrapped pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene. After completing joint, make overlap and secure ends.

3. Repair cuts, tears, punctures or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

D. Pipe-shaped Appurtenances: Cover bends, reducers, offsets and other pipe-shaped appurtenances with polyethylene in same manner as pipe.

E. Odd-shaped Appurtenances: When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in tube, wrap with flat sheet or split length of polyethylene tube by passing sheet around appurtenance and encasing it. Make seams by bringing edges together, folding over twice and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

F. Openings in Encasement: Create openings for branches, service taps, blow-offs, air valves and similar appurtenances by making X-shaped cut in polyethylene and temporarily folding back film. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene, with tape. Service taps may also be made directly through polyethylene, with resulting damaged areas being repaired as specified.

G. Junctions between Wrapped and Unwrapped Pipe: Where polyethylene-wrapped pipe joins adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for distance of at least three feet (3 Ft). Secure end with circumferential turns of tape. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of three feet (3 Ft) away from cast or ductile iron pipe.

3.3 REPAIRS

A. Repair cuts, tears, punctures or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area and secured in place.

END OF SECTION

SECTION 02265

POLYURETHANE COATINGS ON STEEL OR DUCTILE IRON PIPE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Two (2) component polyurethane coating system for use as external coating for steel or ductile iron pipe.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment will be made for work performed under this Section. Include cost of polyurethane coatings in contract unit prices for steel pipe or ductile iron pipe.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D522 Standard Test Method for Mandrel Bend Test of Attached Organic Coatings.

B. AWWA American Water Works Association.

1. AWWA C210 Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 - Measurement and Payment.

2. Section 01330 - Submittal Procedures.

3. Section 02215 – Ductile Iron Pipe (DIP) and Fittings.

4. Section 02250 – Steel Pipe and Fittings.

D. SSPC – Steel Structures Painting Council.

1. SSPC PA2 – Measurement of Dry Paint Thickness with Magnetic Gauges.

2. SSPC PA Guide 3 – A Guide to Safety in Paint Application.

3. SSPC PS Guide 17.00 – Guide for Selecting Urethane Painting Systems.

4. SSPC PS10 – Near-White Blast Cleaning.

1.4 SAFETY

A. Secure, from manufacturer, Material Safety Data Sheet (MSDS) for polyurethane coatings and repair materials listed in this Section.

B. Safety requirements stated in this specification and in related sections apply in addition to applicable federal, state and local rules and regulations. Comply with instructions of coating manufacturer and requirements of insurance underwriters.

C. Follow handling and application practices of SSPC PA Guide 3; SSPC PS Guide 17.00; Coating Manufacturer's Material Safety Data Sheet.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit coating manufacturer's catalog sheets and technical information for approval, prior to delivery of pipe.

C. Obtain from coating manufacturer and submit coating "affidavit of compliance" to requirements of this Section stating that coatings were applied in factory and in accordance with manufacturer's minimum requirements.

1.6 DELIVERY, STORAGE and HANDLING

A. Use standard containers to prevent gelling, thickening deleteriously or forming of gas in closed containers within period of one year (1 Yr) from date of manufacture.

B. Label each container of separately packaged component clearly and durably to indicate date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name or formula specification, number of coatings together with special instructions. Do not use coating components older than one year (1 Yr).

C. Deliver coating materials to pipe manufacturer in sealed containers showing designated name, batch number, color, date of manufacture and name of coating manufacturer.

D. Store material onsite in enclosures, out of direct sunlight in a warm, ventilated and dry area.

E. Prevent puncture, inappropriate opening or other action which may lead to product contamination.

1.7 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that pipe was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 COATING MATERIAL

A. CORROPIPE II PW TOUCHUP (two-component) or approved equal; mix in accordance with coating manufacturer's recommendations.

1. For areas less than or equal to six inches (6 In) in diameter, brush apply.

2. For areas greater than six inches (6 In) in diameter, spray apply.

B. Coating System: Use Type V system which is two (2) package polyisocyanate, polyol-cured urethane coating, mixed in one to one (1:1) ratio at time of application. Components shall be balanced viscosities in their liquid state and not require agitation during use.

C. Exterior Coating Material: CORROPIPE II-TX and Joint Coating Material CORROPIPE II-PW, manufactured by Madison Chemical Industries, Inc.

D. Internal Coating Material: Joint Coating Material CORROPIPE II-PW,

manufactured by Madison Chemical Industries, Inc

E. Cured Coating Properties:

1. Conversion to Solids by Volume: Ninety-seven percent (97%) plus or minus three percent (±3%).

2. Temperature Resistance: Minus forty degrees Fahrenheit (-40° F) and plus one hundred degrees Fahrenheit (130° F).

3. Minimum Adhesion: Five hundred pounds per square inch (500 psi), when applied without primer to ductile iron pipe which has been blasted to comply with SSPC SP10.

4. Cure Time: For handling in one minute (1 Min) at one hundred twenty degrees Fahrenheit (120° F) and full cure within seven days (7 D) at seventy degrees Fahrenheit (70° F).

5. Maximum Specific Gravities: Polyisocyanate resin, 1.20. Polyol resin, 1.15.

6. Minimum Impact Resistance: eighty inch-pounds (80 in-lb) using one inch (1 In) diameter steel ball where coating is applied at thirty (30) mils to ductile iron pipe surface which has been blasted to SSPC No. 10 finish.

7. Minimum Tensile Strength: Two thousand pounds per square inch (2000 psi).

8. Hardness: Fifty-five (55) plus or minus five (±5) Shore D at seventy degrees Fahrenheit (70° F).

9. Flexibility Resistance: ASTM D522 using one inch (1 In) mandrel. Allow coating to cure for seven days (7 D). Perform testing on test coupons held for fifteen minutes (15 Min) at temperature extremes specified in this Paragraph.

2.2 REPAIR AND TOUCHUP MATERIAL

A. CORROPIPE II PW [Two (2) component, brush applied or approved equal]. Mix in accordance with coating manufacturer's recommendations.

PART III: EXECUTION

3.1 SURFACE PREPARATION

A. Remove deposits of oil, grease or other organic contaminates before blast cleaning by using solvent wash as specified in SSPC PA Guide 3. Clean and dry surfaces making them completely dry, free of moisture, dust, grit, oil, grease or other deleterious substances prior to application of coating.

B. Exterior and Interior Surfaces: SSPC SP10, near-white metal blast cleaning. Blast with clean, hard, sharp cutting abrasives with no steel or cast iron shot in mix.

C. Ductile Iron Pipe: Prior to start of production blasting, prepare specimens for white metal blast and near-white metal blast using equipment and abrasives proposed for work. During preparation of specimens, Change blasting intensity and abrasive as necessary to provide degree of cleaning required by SSPC SP10, except that color of blasted substrate is not expected to match color of blasted steel. After examination and concurrence by the Project Manager, production blasting may begin. Monitor and control production blasting so that production pipe surfaces match surface of approved blasting specimens.

3.2 THICKNESS

A. External Coatings: Minimum DFT of twenty-five (25) mils (0.025 inch).

B. Internal Coatings: Minimum DFT of thirty-five (35) mils.

C. Thickness Determinations: Use Type 1 magnetic thickness gauge as described in SSPC PA2 specification. Individual readings below ninety percent (90%) of specified minimum are not acceptable. Average individual spot readings [consisting of three (3) point measurements within three inches (3 In) of each other] less than ninety-five percent (95 %) of minimum are not acceptable. Average of all spot readings less than minimum thickness specified are not acceptable.

3.3 FACTORY APPLICATION OF POLYURETHANE COATING

A. Equipment: Two-component, one to one (1:1) mix ratio, heated airless spray unit.

B. Temperature: Minimum five degrees Fahrenheit (5° F) above dew point temperature. Temperature of surface shall not be less than sixty

degrees Fahrenheit (60° F) during application.

C. Humidity: Heating of pipe surfaces may be required to meet requirements of Paragraph 2.1E, Cured Coating Properties, when relative humidity exceeds eighty percent (80%).

D. Do not thin or mix resins; use as received. Store resins at temperature above fifty-five degrees Fahrenheit (55° F) at all times.

E. Application: Conform to coating manufacturer's recommendations. Apply directly to substrate to achieve specified thickness. Multiple-pass, one (1) coat application process is permitted provided maximum allowable recoat time specified by coating manufacturer is not exceeded.

F. Recoat only when coating has cured less than maximum time specified by coating manufacturer. When coating has cured for more than recoat time, brush-blast or thoroughly sand coating surface. Blow-off cleaning using clean, dry, high pressure compressed air.

G. Cure at ambient temperature above zero degrees Fahrenheit (0° F). Do not handle pipe until coating has been allowed to cure as specified in TABLE 4.1 MINIMUM CURE TIME in this Section.

3.4 JOINTS

A. Apply coating to unlined pipe surfaces including inside of bell socket and outside of spigot.

B. Coating thickness on sealing areas of spigot end of pipe exterior: Minimum eight (8) mils (0.008 inch), maximum of ten (10) mils (0.010 inch). Maximum ten (10) mils may be exceeded in spigot end provided maximum spigot diameter as specified by pipe manufacturer is not exceeded.

3.5 INSPECTION

A. The Project Manager may inspect coatings at coating applicator's facilities.

B. Secure approval of surface preparation by coating manufacturer's representative prior to coating application.

C. Holiday Inspection: Conform to AWWA C210, Section 5.3.3.1. Follow coating manufacturer's recommendation. Conduct inspection any time after coating has reached initial cure. Repair in accordance with

Paragraph 3.7, Repair and Field Touchup.

3.6 PIPE INSTALLATION

A. When required by the Project Manager, provide services of manufacturer's representative for period of not less than two weeks (2 Wks) at beginning of actual pipe laying operations to advise the Contractor regarding installation, including, but not limited to, handling and storing, cleaning and inspecting, coatings repairs and general construction methods as to how they may affect pipe coatings.

B. Use nylon straps, padded lifts and padded storage skids. Field cuts shall be kept to minimum. Repair damage to coating due to handling or construction practices. See Section 02215 – Ductile Iron Pipe (DIP) and Fittings and Section 02250 – Steel Pipe and Fittings for additional requirements.

C. Just before each section of pipe is to be placed into trench, conduct visual and holiday inspection. Repair defects in coating system before pipe is installed.

3.7 REPAIR AND FIELD TOUCHUP

A. Apply repair and touchup materials to holidays and other deficient coating in conformance with factory application of polyurethane coating requirements specified in this Section, excluding equipment requirements.

B. Repair Procedure – Holidays:

1. Remove traces of oil, grease, dust, dirt and other deleterious materials.

2. Roughen area to be patched by sanding with rough grade forty (40) grit sandpaper.

3. Apply one (1) coat of repair material described above. Work repair material into scratched surface by brushing.

C. Repair Procedure – Field Cuts or Large Damage:

1. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.

2. Remove traces of oil, grease, dust, dirt and other deleterious materials

3. Roughen area to be patched with rough grade forty (40) grit sandpaper. Feather edges and include overlap of one inch (1 In) to two inches (2 In) of roughened polyurethane in area to be patched.

4. Apply thick coat of repair material described above. Work repair material into scratched surface by brushing. Feather edges of repair material into prepared surface. Cover at least one inch (1 In) of roughened area surrounding damage or adjacent to field cut.

D. Repair Procedure Thermite Brazed Connection Bonds:

1. Remove polyurethane coating with power wire brush from area on metal surface which is to receive thermite brazed connection.

2. Grind metal surface to shiny metal with power grinder and coarse grit grinding wheel.

3. Apply thermite-brazed connection using equipment, charge and procedure recommended by manufacturer of thermite equipment.

4. After welded surface has cooled to temperature below one hundred thirty degrees Fahrenheit (130° F), apply protective coating repair material to weld, exposed pipe surface and damaged areas of polyurethane coating.

5. Do not cover or backfill freshly repaired areas of coating at thermite-brazed connection until repair material has completely cured. Allow material to cure in conformance with manufacturer s recommendations.

PART VI: TABLES

4.1 MINIMUM CURE TIME

Ambient Temperature	Minimum Full Cure Time
Over 70 degrees F	7 days
50 to 70 degrees F	9 days
0 to 50 degrees F	12 Days

END OF SECTION

SECTION 02270

AUGERING WATER PIPE AND CONDUIT

PART I: GENERAL

1.1 GENERAL REQUIRMENTS

A. Installing water line service pipe by methods of augering or casing by jacking and boring.

B. Installing Telecommunication Conduit along or under Public Ways

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1 No separate payment will be made for augering pipe for water lines under this Section. Include payment in the unit price for Section 02400 Water Lines.

2. When open-cut construction is requested by the Contractor for his convenience in areas designated for augering and when approved in advance by the Project Manager, such areas shall be paid for at the unit price for Section 02400 Water Lines.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 DEFINITIONS

A. Auger Method: Installation of steel casing by excavating soil at advancing end of casing and transporting spoil through casing by otherwise uncased auger, while advancing casing by jacking at same rate as auger excavation progresses.

B. Slurry Auger Method: Installation of casing or pipe by first drilling small diameter pilot hole from pit to pit, followed by removing excess soil and installing pipe or conduit by pull-back or jacking method.

1.4 REFERENCE STANDARDS

A. ASTM American Society for Testing and Materials.

1. ASTM D638 Standard Test Method for Tensile Properties of Plastics.

2. ASTM D648 Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.

3. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics.

4. ASTM D790 Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01555 Traffic Control and Regulation.

4. Section 01580 Waste Material Disposal.

5. Section 01585 Control of Ground and Surface Water.

6. Section 02100 Clearing and Grubbing.

7. Section 02125 Excavation and Backfill for Utilities.

8. Section 02250 Steel Pipe and Fittings.

9. Section 02280 Trench Safety Systems.

10. Section 02400 Water Lines.

11. Section 03105 Grout.

1.5 REGULATORY REQUIREMENTS

A. Conform to Texas Department of Transportation (TxDOT) for

installations under state highways. The City shall obtain required permits for State Highway crossings on behalf of the contractor.

B. Installations Under Railroads:

1. The City shall obtain required permits for Railroad crossings, from affected railroad companies, on behalf of the Contractor.

2. Comply with requirements of right-of-entry for crossing Railroad Company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements.

3. Use dry auger method only.

4. Damages due to delays caused by railroad requesting work to be done at hours which shall not inconvenience railroad shall be at no additional cost to the City.

5. Maintain a minimum of thirty-five foot (35 Ft) clearance from centerline of tracks, to the closest edge of the bore pit, but in any case outside of the right-of-way unless otherwise permitted by the railroad.

6. At no time shall any equipment, excavations or materials be closer than thirty-five feet (35 Ft) from the centerline of tracks.

1.6 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. For installation by augering, submit for review:

1. Description of mechanized excavating equipment.

2. Method of controlling line and grade.

3. Grouting techniques to be used for filling annular void between water line pipe and casing, and void between water line pipe or casing and ground, including equipment, pumping and injection procedures, pressure grout types, and mixes.

4. Locations and dimensions of pits.

5. Pit design and construction drawings.

6. Identification of casings required and paid under Contract and

casings installed at the Contractor's option.

7. Design of casings.

8. Copy of railroad company permits and right-of-entry.

C. Prepare auger pit and casing design submittals that are site specific. Have auger pit and casing design submittals signed and sealed by a Professional Engineer licensed by State of Texas.

D. Include in construction phase submittals:

1. Daily logs of augering and boring operations

2. Settlement monitoring data to meet requirements of paragraph 3.11, Settlement Monitoring.

3. Submit daily logs and settlement monitoring data within five days (5 D) after day of observation

1.7 CRITERIA FOR CASING INSTALLATION LOADS

A. The Contractor shall be responsible for selection of casing, pipe and pipe joints to carry anticipated thrust of jacks or loads.

PART II: PRODUCTS

2.1 MATERIALS

A. Piping and Fittings: As required by the Technical Specifications or the Drawings.

B. Casings: Where shown on the Drawings, in accordance with Section 02250 Steel Pipe and Fittings.

C. Casing Spacers: Where casings are shown on the Drawings, use casing spacer width eight inches (8 In) for pipe sizes four inches (4 In) to twelve inches (12 In); twelve inches (12 In) for pipe sizes fourteen inches (14 In) and larger. Wood skids or concrete "donuts" are not acceptable.

1. For welded steel pipe twelve inches (12 In) and smaller, use Pipeline Seal & Insulator Model PE or approved equal.

2. For other pipe materials, use Pipeline Seal & Insulator Model

C8G-2 or approved equal for pipe sizes up to twelve inches (12 In).

3. For all pipe sizes above twelve inches (12 In), use Pipeline Seal & Insulator Model C12G-2 or approved equal.

4. Obtain approval for equal product in writing from the Project Manager prior to bid.

5. Use ISO-9002 registered casing spacer manufacturer or supplier. Submit copy of current certificate with submittal package.

D. Casing End Seals: Provide Pipeline Seal and Insulator Model C or approved equal.

E. Casing Spacers (For Pipes Diameters sixteen inches (16 In) or Greater): Bolt-on style with shell made of two (2) sections of fourteen (14) gauge carbon steel, hot rolled, cleaned and lined with PVC liner, ninety thousandths inch (0.090 In) thick with Durometer A 85-90 overlapping edges to secure liner to spacer; deep embossed flanges for added strength; coated prior to installation of liner and runner with fusion-bonded PVC powder of fourteen (14) mils to twenty (20) mils thickness; electroplated studs, nuts and washers.

1. Runners [For Pipe Diameters sixteen inches (16 In) or Greater]: Supported by ten (10) gauge carbon steel MIG risers welded to shell. Total length of weld beads shall be at least fifty percent (50%) of the length of the runner. Fill bolt holes with caulk or approved equal to provide a water-tight seal. Minimum requirements: Glass reinforced plastic conforming to the following tests:

   a. Tensile Strength: ASTM D638; Seventeen thousand six hundred pounds per square inch (17600 psi).

   b. Flexural Strength: ASTM D790; Twenty-Five thousand three hundred pounds per square inch (25300 psi).

   c. Compression Strength: ASTM D695; Eighteen thousand pounds per square inch (18000 psi).

   d. Deflection Temperature at two hundred sixty-four pounds per square inch (264 psi): ASTM D648; Four hundred five degrees Fahrenheit (405° F).

e. Polyethylene runners are not acceptable.

PART III: EXECUTION

3.1 LIMITS ON AUGER LENGTH WITHOUT CASING

A. Do not exceed one hundred feet (100 Ft) for length of auger hole without receiving pit.

B. Do not exceed seventy-five feet (75 Ft) for length of auger hole for PVC pipe twelve inches (12 In) and less in diameter without receiving pit.

C. Do not exceed forty feet (40 Ft) for length of auger hole for PVC pipe fourteen inches (14 In) to twenty-four inches (24 In) in diameter without receiving pit.

D. Specifications in this paragraph that are in conflict with permit requirements, the permit requirements shall supersede all Technical Specifications. As such this may require substitution of other materials.

3.2 PREPARATION

A. Conform to applicable provisions of Section 02100 Clearing and Grubbing.

B. Utility Relocations: Relocate utility lines clear of pit and zone of potential significant settlement or other ground disturbance.

C. Install casings as required by the Drawings, in accordance with this Section.

D. Install temporary solid plug at open end of water line to prevent contamination.

3.3 TRAFFIC CONTROL

A. Conform to applicable provisions of Section 01555 Traffic Control and Regulation.

B. Secure right-of-entry for crossing Railroad Company's easement or right-of-way.

C. During construction operations, furnish and maintain barricades and lights to safeguard traffic and pedestrians, until such time as backfill has been completed and removed from site. Provide additional barricades

and lights as directed by the Project Manager.

3.4 LOCATION AND SIZE OF AUGER PITS

A. Show location of auger pits on auger pit construction drawings. Locate auger pits for slurry boring so that distance between pits is no greater than eighty feet (80 Ft); and for dry augering not more than one hundred twenty feet (120 Ft) apart, except where larger distances are required by railroad permits or railroad rights-of-way.

B. Locate auger pits and associated work areas to avoid blocking driveways and cross streets and to minimize disruption to business and commercial interests. Avoid auger pit locations near areas identified as potentially contaminated.

C. Pit Size: Size pits to provide adequate room to meet operational requirements for auger construction as well as structures indicated on the Drawings. Provide minimum six inch (6 In) space between pipe and walls of auger pit. Maximum allowable width of pit shall be five feet (5 Ft). Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than five feet (5 Ft) longer than one (1) full section of pipe and shall not exceed twenty-five feet (25 Ft).

D. Excavate bore pits to finished grade at least six inches (6 In) lower than grade indicated by stakes.

E. Auger pits that are excavated and backfilled as part of open-cut water line construction shall be in accordance with Section 02125 Excavation and Backfill for Utilities.

F. Provide and properly maintain safety protection against traffic and accidental or unauthorized entry. Provisions to include concrete traffic barriers or other suitable barriers around periphery of pit as appropriate. Fully cover and secure pits where no construction activity is in progress.

G. Install sheeting, lining, shoring and bracing required for protection of workmen and public in accordance with Section 02280 Trench Safety Systems.

H. Provide full cover or other security fencing for each access pit in which there is no construction activity or which is unattended by the Contractor's personnel.

I. Provide groundwater control and drainage from pits while work is in progress and until pit is properly backfilled. Conform to requirements of Section 01585 Control of Ground and Surface Water.

3.5 AUGERING (BORING)

A. Auger from approved pit locations. Excavate for pits and install shoring as outlined above under Paragraph 3.4, Pits. Auger mechanically with use of pilot hole entire length of crossing and check for line and grade. Diameter of auger hole not to exceed pipe bell diameter plus two inches (2 In). Place excavated material outside working pit and dispose of as specified. Use water or other fluids in connection with boring operation only to lubricate cuttings; jetting is not permitted.

B. In unconsolidated soil formations, gel-forming colloidal drilling fluid may be used. Fluid is to consist of at least ten percent (10%) of high-grade processed bentonite and shall consolidate cuttings of bit, seal walls of hole and shall furnish lubrication for subsequent removal of cuttings and installation of pipe.

C. Depending on character of soil encountered during augering operation, conduct operations without interruption, insofar as practical, to prevent hole from collapsing or pipe from seizing up in hole before installation is complete.

D. Allowable variation from line and grade shall be as specified under Paragraph 3.9, Jacking.

E. Remove and replace pipe damaged in augering operations.

3.6 DRY AUGERING OF CASING

A. Provide jacks, mounted on frame or against backstop, of capacity suitable for forcing excavating auger and casing through soil conditions to be encountered. Operate jacks so that even pressure is applied to casing.

B. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing.

C. Bentonite slurry may be used to lubricate casing during installation. Use of water to facilitate removal of spoil is permitted; however, water jetting for excavation of soil is not allowed when jacking casing.

D. Tolerances from lines and grades shown on the Drawings for water line pipe installed in casing are plus or minus six inches (±6 In) in horizontal alignment, and plus or minus one and one-half inches (±1-1/2 In) in elevation.

3.7 SLURRY BORING OF CASING OR PIPE

A. Drill small diameter pilot hole and check for line and grade at receiving end. Re-drill pilot hole when bored pipe does not meet specified tolerances.

B. Using pilot hole as guide bore larger diameter hole of sufficient size for pipe or casing installation. Water jetting is not permitted.

C. Bentonite slurry may be used to maintain stable hole and furnish lubrication for pipe or casing installation.

D. Tolerances from lines and grades shown on the Drawings for installed water line pipe are plus or minus six inches (±6 In) in horizontal alignment and plus or minus one and one-half inches (±1-1/2 In) in elevation.

E. Completely fill annular space between water line pipe and surrounding soil or casing as specified in Paragraph 3.8, Filling Annular Space.

F. Do not discharge auguring liquid into operating storm sewer system. If water only, pump to adjacent ground area where sediment shall be filtered from the liquid by ground. If auguring liquid is Bentonite slurry, pump to tank or container, and dispose of off-site.

3.8 FILLING ANNULAR SPACE

A. For installation of water line, block void space around pipe in augered hole with approximately twelve inches (12 In) of packed clay or approved equal material to prevent bedding or backfill from entering void around pipe in augered hole when compacted. For pipe diameters four inches (4 In) through eight inches (8 In) use minimum one-half cubic foot (1/2 Cf) clay; for pipe diameters twelve inches (12 In) through sixteen inches (16 In) use minimum three-quarters cubic foot (3/4 Cf) clay.

3.9 JACKING

A. Comply with Section 02280 Trench Safety for all pits, end trenches and other excavations relating to work required by the Technical Specifications. Dewater as required to provide safe working conditions.

B. Wherever end trenches are cut into sides of embankment or beyond it, sheath securely and brace such work to prevent earth caving.

C. Make up only one (1) joint at time in pit or trench prior to jacking.

D. Do not interfere with operation of railroad, street, highway or other facility, nor weaken or damage embankment or structure.

E. Use heavy-duty jacks sized for forcing casing through embankment. Use appropriate jacking head, usually of timber and bracing between jacks and jacking head and jacking frame or backstop. Apply jacking pressure uniformly around ring of casing. Set casing to be jacked on guides, properly braced together, to support section of casing and to direct it in proper line and grade. Place jacking assembly in line with direction and grade of casing. Excavate embankment material just ahead of casing and remove material through casing. Force casing through embankment with jacks into excavated auger hole.

F. Conform excavation for underside of casing to contour and grade of casing, for at least one-third (1/3) of circumference of casing. Provide clearance of not more than two inches (2 In) for upper half of casing. Taper off upper clearance to zero (0) at point where excavation conforms to contour of casing.

G. Excavation may extend beyond end of casing depending on character of material, but shall not exceed two feet (2 Ft). Decrease advance excavation at direction of the Project Manager, when character of material being excavated makes it desirable to keep advance excavation closer to end of casing.

H. Jack casing from low or downstream end. Lateral or vertical variation in final position of casing from line and grade as shown on the Drawings shall be permitted only to extent of one inch (1 In) in ten feet (10 Ft), provided such variation is regular and only in one (1) direction and that final grade of flow line is in direction indicated on the Drawings.

I. Use cutting edge of steel plate around head end of casing extending short distance beyond end of casing with inside angles or lugs to keep cutting edge from slipping back onto casing.

J. Once jacking of casing is begun, carry on without interruption, insofar as practicable, to prevent casing from becoming firmly set in embankment.

K. Remove and replace casing damaged in jacking operations.

L. Backfill pits or trenches excavated to facilitate jacking operations immediately after completion of jacking of casing.

M. Grout annular space between casing and excavated hole when loss of embankment occurs or when clearance of two inches (2 In) is exceeded. Grout as specified in Section 03105 □ Grout.

3.10 SPACER INSTALLATION

A. There shall be no inadvertent metallic contact between casing and carrier pipe. Place spacers to ensure that carrier pipe is adequately supported throughout length, particularly at ends, to offset settling and possible electrical shorting unless otherwise approved by the Project Manager. Place end spacer within six inches (6 In) of end of casing pipe, regardless of size of casing and carrier pipe or type of spacer used. Spacing between spacers depends largely on load bearing capabilities of pipe coating and flexibility of pipe.

B. Grade bottom of trench adjacent to each end of casing to provide firm, uniform and continuous support for carrier pipe. When trench requires some backfill to establish final trench bottom grade, place backfill material in six inch (6 In) lifts and compact to density of undisturbed soil.

C. Install casing spacers in accordance with manufacturer□s instructions. Take special care to ensure that sub-components are correctly assembled and evenly tightened and that no damage occurs during tightening of insulators or carrier pipe insertion.

D. Seal annulus between carrier pipe and casing with casing end seals at each end of casing.

E. Insulator Spacing:

1. Spacing shall be as shown on Drawing with maximum distance between spacers to be ten feet (10 Ft) for pipe sizes four inches (4 In) to fourteen inches (14 In) and eight feet (8 Ft) for pipe sizes sixteen inches (16 In) to thirty inches (30 In).

2. For ductile iron pipe or bell-and-spigot pipe, install spacers within one foot on each side of bell or flange and one (1) in center of joint when eighteen foot (18 Ft) to twenty foot (20 Ft) long joints are used.

3. If casing or carrier pipe is angled, bent or dented, reduce spacing as directed by the Project Manager. Provide casing with smooth, continuous interior surface.

3.11 SETTLEMENT MONITORING

A. Monitor ground surface elevation along length of augering operation. Locate and record settlement monitoring points with respect to construction baseline and elevations. Record elevations to accuracy of one hundredth feet (0.01 Ft) for each monitoring point location. Establish monitoring points at locations and by methods that protect them from damage by construction operations, tampering, or other external influences. As minimum, locate survey points as follows:

1. For road crossings: Centerline and each shoulder.

2. Railroads: Track subbase at centerline of each track.

3. Utilities and Pipelines: Directly above and ten feet (10 Ft) before and after utility or pipeline intersection.

4. Long bores under improved areas such as pavements: Ground surface elevations must be recorded on centerline ahead of augering operations at locations not to exceed fifty feet (50 Ft) apart (including points located for roads, railroads, utilities, and pipelines), or at least three (3) locations per augering drive.

B. Reading Frequency and Reporting. Take settlement survey readings:

1. Prior to auger excavation reaching point.

2. After auger reaches monitoring point in plan.

3. After grouting of ground supporting pipe or casing is complete.

C. Immediately report to the Project Manager movement, cracking, or settlement which is detected.

D. Following substantial completion but prior to final completion, make final survey of monitoring points.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Remove and dispose of spoil from job site in accordance with Section 01580 Waste Material Disposal.

END OF SECTION

SECTION 02275

PIPE AND CASING AUGERING FOR SANITARY SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Installation of casing for sewer line pipe by dry augering or slurry boring methods, together with installation of sewer line pipe in casing.

B. Installation of sewer line pipe by slurry boring methods. Construction casing may be used at the Contractor's option.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Casing, including sewer line pipe, installed by augering methods in mid-run of open cut segments where shown on the Drawings, shall be measured and paid by linear foot from end to end of casing. Casing may be installed, at the Contractor's option, at locations other than shown on the Drawings, at no additional cost to the City.

2. Sewer line pipe installed by augering method in mid-run of open-cut segments where shown on the Drawings, shall be measured and paid by linear foot from end to end of augered section.

3. Pipe or casing segments installed by augering methods in locations other than mid-run of open cut segments and shown on the Drawings, shall be measured and paid by linear foot along centerline of completed sewer line from centerline to centerline of manholes to ends of stubs or termination of pipe, and to inside face of lift stations and other structures.

4. Payment shall include and be full compensation for labor, equipment, materials and supervision for excavation and construction of sewer line, complete in place including disposal of excess materials, shoring, dewatering, utility adjustments, grouting, backfill, clean-up, and other related work necessary for construction as indicated on the Drawings and specified in this Section.

5. Cost for pits and other excavations are included in the unit price for pipe with or without casing.

6. Trench safety systems for pits are paid as specified in Section 02280 Trench Safety Systems.

7. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 DEFINITIONS

A. Augering means either dry augering or slurry augering.

B. Dry augering is jacking casing while excavating soil at heading and transporting spoil back through casing by otherwise uncased auger.

C. Slurry Auger Method: Installation of casing or pipe by first drilling small diameter pilot hole from shaft to shaft, followed by removing excess soil and installing pipe or conduit by pull back or jacking method.

1.4 REFERENCE STANDARDS

A. AREMA American Railway Engineering and Maintenance-of-Way Association.

1. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

B. AASHTO American Association of State Highway and Transportation Officials.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01555 Traffic Control and Regulation.

4. Section 01580 Waste Material Disposal.

5. Section 01585 Control of Ground and Surface Water.

6. Section 02100 Clearing and Grubbing

7. Section 02250 Steel Pipe and Fittings.

8. Section 02280 Trench Safety Systems.

9. Section 02500 Gravity Sanitary Sewers.

10. Section 02525 Acceptance Testing of Gravity Sanitary Sewer.

11. Section 03105 Grout.

1.5 REGULATORY REQUIREMENTS

A. Conform to Texas State Department of Transportation (TxDOT) for installations under state highways. The City shall obtain required permits for State Highway crossings on behalf of the Contractor.

B. Installations under Railroads:

1. The City shall obtain required permits for Railroad crossings, from affected railroad companies, on behalf of the Contractor.

2. Comply with requirements of right-of-entry for crossing Railroad Company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements.

3. Use dry auger method only.

4. Damages due to delays caused by railroad requesting work to be done at hours which shall not inconvenience railroad shall be at no additional cost to the City.

5. Maintain a minimum of thirty-five foot (35 Ft) clearance from centerline of tracks, to the closest edge of the bore pit, but in any case outside of the right-of-way unless otherwise permitted by the railroad.

6. At no time shall any equipment, excavations or materials be closer than thirty-five feet (35 Ft) from the centerline of tracks.

1.6 SUBMITTAL

A. Conform to requirements of Section 01330 Submittal Procedures.

B. For installation by augering, submit for review:

1. Description of mechanized excavating equipment.

2. Method of controlling line and grade.

3. Grouting techniques to be used for filling annular void between sewer line pipe and casing, and void between sewer line pipe or casing and ground, including equipment, pumping and injection procedures, pressure grout types, and mixes.

4. Locations and dimensions of pits.

5. Pit design and construction drawings.

6. Identification of casings required and paid under Contract and casings installed at the Contractor s option.

7. Design of casings.

8. Copy of railroad company permits and right-of-entry.

C. Prepare auger pit and casing design submittals that are site specific. Have auger pit and casing design submittals signed and sealed by a Professional Engineer licensed by the State of Texas.

D. Include in construction phase submittals:

1. Daily logs of augering and boring operations.

2. Settlement monitoring data to meet requirements of paragraph 3.8, Settlement Monitoring.

3. Submit daily logs and settlement monitoring data within five (5) days after day of observation.

1.7 CRITERIA FOR DETERMINING CASING INSTALLATION LOADS

A. Select and design casing pipe and pipe joints to carry thrust of jacks or loads due to pulling mechanism in combination with overburden, earth and hydrostatic loads. Select casings for dry augering to withstand action of auger without damage.

B. Use Professional Engineer licensed by the State of Texas to determine design stresses, design deflections and factors of safety for design of casing. Present such determination as part of design submittal. Apply the following maximum casing pipe stresses and deflections to casings shown on the Drawings:

1. Design stress in pipe wall: Fifty percent (50%) of minimum yield point of steel or eighteen thousand pounds per square inch (18000 psi), whichever is less, when subjected to applicable loading conditions.

2. Wall thickness: Maximum allowable deflection which does not exceed three percent (3%) of nominal casing diameter.

C. Use Cooper E-80 locomotive loading distributions as criteria for railroad crossings in accordance with AREMA specifications for culverts. In design, account for additive loadings due to multiple tracks.

D. Use H-20 vehicle loading distributions as criteria for truck loading in accordance with AASHTO.

E. When not specifically indicated on the Drawings, select casing diameter to permit practical installation (including skids when applicable) and grouting.

PART II: PRODUCTS

2.1 MATERIALS

A. Provide casing pipe which is straight, circular in section, uncoated, welded steel pipe, in accordance with Section 02250 □ Steel Pipe and Fittings.

B. Provide sewer line pipe in accordance with Section 02500 □ Gravity Sanitary Sewers. Do not use high density polyethylene pipe for augering.

C. Provide restrained-joint sewer line pipe when installing sewer line pipe in slurry bored holes by pullback method.

D. Supply grout as specified in Section 03105 □ Grout.

PART III: EXECUTION

3.1 PREPARATION

A. Conform to applicable provisions of Section 02100 - Clearing and Grubbing.

B. Utility Relocations: Relocate utility lines clear of pit and zone of potential significant settlement or other ground disturbance.

C. Install casings as required by the Drawings, in accordance with this Section.

D. Install temporary solid plug at open end of water line to prevent contamination.

3.2 TRAFFIC CONTROL

A. Conform to applicable provisions of Section 01555 - Traffic Control and Regulation.

B. Secure right-of-entry for crossing Railroad Company's easement or right-of-way.

C. During construction operations, furnish and maintain barricades and lights to safeguard traffic and pedestrians, until such time as backfill has been completed and removed from site. Provide additional barricades and lights as directed by the Project Manager.

3.3 LOCATION AND SIZE OF AUGER PITS

A. Show location of auger pits on auger pit construction drawings. Locate auger pits for slurry boring so that distance between pits is no greater than eighty feet (80 Ft); and for dry augering not more than one hundred twenty feet (120 Ft) apart, except where larger distances are required by railroad permits or railroad rights-of-way.

B. Locate auger pits and associated work areas to avoid blocking driveways and cross streets and to minimize disruption to business and commercial interests. Avoid auger pit locations near areas identified as potentially contaminated.

C. Pit Size: Size pits to provide adequate room to meet operational requirements for auger construction as well as structures indicated on the Drawings. Provide minimum six inch (6 In) space between pipe and

walls of auger pit. Maximum allowable width of pit shall be five feet (5 Ft). Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than five feet (5 Ft) longer than one (1) full section of pipe and shall not exceed twenty-five feet (25 Ft).

D. Excavate bore pits to finished grade at least six inches (6 In) lower than grade indicated by stakes.

E. Auger pits that are excavated and backfilled as part of open-cut water line construction shall be in accordance with Section 02125 - Excavation and Backfill for Utilities.

F. Provide and properly maintain safety protection against traffic and accidental or unauthorized entry. Provisions to include concrete traffic barriers or other suitable barriers around periphery of pit as appropriate. Fully cover and secure pits where no construction activity is in progress.

G. Install sheeting, lining, shoring and bracing required for protection of workmen and public in accordance with Section 02280 - Trench Safety Systems.

H. Provide full cover or other security fencing for each access pit in which there is no construction activity or which is unattended by the Contractor's personnel.

I. Provide groundwater control and drainage from pits while work is in progress and until pit is properly backfilled. Conform to requirements of Section 01585 - Control of Ground and Surface Water.

3.4 DRY AUGERING OF CASING

A. Provide jacks, mounted on frame or against backstop, of capacity suitable for forcing excavating auger and casing through soil conditions to be encountered. Operate jacks so that even pressure is applied to casing.

B. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing.

C. Bentonite slurry may be used to lubricate casing during installation. Use of water to facilitate removal of spoil is permitted; however, water jetting for excavation of soil is not allowed when jacking casing.

D. Tolerances from lines and grades shown on the Drawings for gravity sewer line pipe installed in casing are plus or minus six inches (±6 In) in

horizontal alignment, and plus or minus one and one-half inches (±1-1/2 In) in elevation.

3.5 SLURRY BORING OF CASING OR PIPE

A. Drill small diameter pilot hole and check for line and grade at receiving end. Redrill pilot hole when bored pipe does not meet specified tolerances.

B. Using pilot hole as guide bore larger diameter hole of sufficient size for pipe or casing installation. Water jetting is not permitted.

C. Bentonite slurry may be used to maintain stable hole and furnish lubrication for pipe or casing installation.

D. Tolerances from lines and grades shown on the Drawings for installed sewer line pipe are plus or minus six inches (±6 In) in horizontal alignment and plus or minus one and one-half inches (±1-1/2 In) in elevation.

E. Completely fill annular space between sewer line pipe and surrounding soil or casing with grout, without displacing pipe during grouting operation.

F. Do not discharge auguring liquid into operating storm sewer system. If water only, pump to adjacent ground area where sediment shall be filtered from the liquid by ground. If auguring liquid is Bentonite slurry, pump to tank or container, and dispose of off-site.

3.6 FILLING ANNULAR SPACE

A. Grout annular void between sewer line pipe and casing from end to end of casing. Block and brace sewer line pipe to prevent movement during grout placement and to maintain specified line and grade. Grout as specified in Section 03105 Grout.

3.7 SPACER INSTALLATION

A. There shall be no inadvertent metallic contact between casing and carrier pipe. Place spacers to ensure that carrier pipe is adequately supported throughout length, particularly at ends, to offset settling and possible electrical shorting unless otherwise approved by the Project Manager. Place end spacer within six inches (6 In) of end of casing pipe, regardless of size of casing and carrier pipe or type of spacer used. Spacing between spacers depends largely on load bearing capabilities of pipe coating and flexibility of pipe.

B. Grade bottom of trench adjacent to each end of casing to provide firm, uniform and continuous support for carrier pipe. When trench requires some backfill to establish final trench bottom grade, place backfill material in six inch (6 In) lifts and compact to density of undisturbed soil.

C. Install casing spacers in accordance with manufacturer's instructions. Take special care to ensure that sub-components are correctly assembled and evenly tightened and that no damage occurs during tightening of insulators or carrier pipe insertion.

D. Seal annulus between carrier pipe and casing with casing end seals at each end of casing.

E. Insulator Spacing:

1. Spacing shall be as shown on Drawing with maximum distance between spacers to be ten feet (10 Ft) for pipe sizes four inches (4 In) to fourteen inches (14 In) and eight feet (8 In) for pipe sizes sixteen inches (16 In) to thirty inches (30 In).

2. For ductile iron pipe or bell-and-spigot pipe, install spacers within one foot on each side of bell or flange and one (1) in center of joint when eighteen feet (18 Ft) to twenty foot (20 Ft) long joints are used.

3. If casing or carrier pipe is angled, bent or dented, reduce spacing as directed by the Project Manager. Provide casing with smooth, continuous interior surface.

3.8 SETTLEMENT MONITORING

A. Monitor ground surface elevation along length of augering operation. Locate and record settlement monitoring points with respect to construction baseline and elevations. Record elevations to accuracy of 0.01 feet for each monitoring point location. Establish monitoring points at locations and by methods that protect them from damage by construction operations, tampering, or other external influences. As minimum, locate survey points as follows:

1. For road crossings: Centerline and each shoulder.

2. Railroads: Track subbase at centerline of each track.

3. Utilities and Pipelines: Directly above and ten feet (10 Ft) before and after utility or pipeline intersection.

4. Long bores under improved areas such as pavements: Ground surface elevations must be recorded on centerline ahead of augering operations at locations not to exceed fifty feet (50 Ft) apart (including points located for roads, railroads, utilities, and pipelines), or at least three (3) locations per augering drive.

B. Reading Frequency and Reporting. Take settlement survey readings:

1. Prior to auger excavation reaching point.

2. After auger reaches monitoring point in plan.

3. After grouting of ground supporting pipe or casing is complete.

C. Immediately report to the Project Manager movement, cracking, or settlement which is detected.

D. Following substantial completion but prior to final completion, make final survey of monitoring points.

3.9 DISPOSAL OF EXCESS MATERIAL

A. Remove and dispose of spoil from job site in accordance with Section 01580 Waste Material Disposal.

3.10 LEAKAGE TESTING

A. Test sanitary sewers for leakage by low pressure air methods in accordance with Section 02525 Acceptance Testing of Gravity Sanitary Sewer.

END OF SECTION

SECTION 02280

TRENCH SAFETY SYSTEMS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Trench safety system for the construction of trench excavations.

B. Trench safety system for structural excavations which fall under provisions of State and Federal trench safety laws.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES:

1. Measurement for trench safety systems used on trench excavations is on a linear foot basis measured along the centerline of the trench, including manholes and other line structures.

2. No payment will be made for trench safety systems for structural excavations under this section. Include payment for trench safety system in applicable structure installation sections.

3. Refer to Section 01270 - Measurement and payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 DEFINITIONS

A. A trench shall be defined as a narrow excavation (in relation to its depth) made below the surface of the ground at a minimum of five feet (5 Ft) in depth. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than fifteen feet (15 Ft).

B. The trench safety system requirements shall apply to larger open excavations if the erection of structures or other installations limits the

space between the excavation slope and these installations to dimensions equivalent of a trench as defined.

C. Trench Safety Systems include, but are not limited to, sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Section 01330 - Submittal Procedures.

B. Submit a safety program specifically for the construction of trench excavation. Design the trench safety program to be in accordance with OSHA 29CFR standards governing the presence and activities of individuals working in and around trench excavations.

C. Construction and shop drawings containing deviations from OSHA standards or special designs shall be sealed by a Professional Engineer licensed by the State of Texas retained and paid by the Contractor.

D. Review of the Contractor's safety program by the Project Manager shall only be in regard to compliance with this specification and shall not constitute approval by the Project Manager nor relieve the Contractor of obligations under State and Federal trench safety laws.

1.5 REGULATORY REQUIREMENTS

A. Install and maintain trench safety systems in accordance with the detail the Specifications set out in the provision of Excavations, Trenching, and Shoring, Federal Occupation Safety and Health Administration (OSHA) Standards, 29CFR, Part 1926, Subpart P, as amended, including Final Rule, published in the Federal Register Vol. 54, No. 209 on Tuesday, October 31, 1989. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652.

B. A reproduction of the OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209 is available upon request to the Contractors bidding on City projects. The City assumes no responsibility for the accuracy of the reproduction. The Contractor is responsible for obtaining a copy of this section of the Federal Register.

C. Legislation that has been enacted by the Texas Legislature with regard to Trench Safety Systems, is hereby incorporated, by reference, into

these specifications. Refer to Texas Health and Safety Code Ann., §756.022 (Vernon 1991).

D. Reference materials, if developed for a specific project, shall be issued with the Bid Documents, including the following:

1. Section 00200 - Geotechnical Information: information obtained for use in design of the trench safety system.

1.6 INDEMNIFICATION

A. The Contractor shall indemnify and hold harmless the City, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

B. The Contractor acknowledges and agrees that this indemnity provision provides indemnity for the City in case the City is negligent either by act or omission in providing for trench safety, including, but not limited to safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

1.7 REFERENCED STANDARDS

A. CFCO City of Friendswood Code of Ordinances.

1. Ordinance 70-114 Trench Excavation Safety Compliance.

2. Ordinance 70-147 Violation of Conditions; Revocation; Repair by the City.

3. Ordinance 70-148 Surety Bond Required.

B. CFTS City of Friendswood Technical Specifications.

1. Section 00200 Geotechnical Information.

2. Section 01270 Measurement and Payment.

3. Section 01330 Submittal Procedures.

C. OSHA Occupational Safety and Health Administration.

1. OSHA Standards, 29CFR, Part 1926, Subpart P.

2. Federal Register Vol. 54, No. 209.

D. Texas Health and Safety Code Ann., §756.022 (Vernon 1991).

PART II: PRODUCTS Not Used

PART III: EXECUTION

3.1 INSTALLATION

A. Install and maintain trench safety systems in accordance with provisions of OSHA 29CFR.

B. Install specially designed trench safety systems in accordance with the Contractor s trench excavation safety program for the locations and conditions identified in the program.

C. A competent person, as identified in the Contractor s Trench Safety Program, shall verify that trench boxes and other premanufactured systems are certified for the actual installation conditions.

3.2 INSPECTION

A. The Contractor, or the Contractor s independently retained consultant, shall make daily inspections of the trench safety systems to ensure that the installed systems and operations meet OSHA 29CFR and other personnel protection regulations requirements.

B. If evidence of possible cave-ins or slides is apparent, the Contractor shall immediately stop work in the trench and move personnel to safe locations until the necessary precautions have been taken by the Contractor to safeguard personnel entering the trench.

C. Maintain a permanent record of daily inspections.

3.3 FIELD QUALITY CONTROL

A. The Contractor shall verify specific applicability of the selected or specially designed trench safety systems to each field condition encountered on the project.

B. The Project Manager, under written or oral authority of the Director or Deputy Director of Community Development shall stop work on portions of the Work where conditions, equipment or personnel put other personnel, the general public or adjacent property in danger of injury or damage. Work shall not resume until conditions have been remedied

and verified by the Project Manager.

END OF SECTION

SECTION 02285

CATHODIC PROTECTION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cathodic protection for metallic water mains, fittings and appurtenances.

B. Trenching, drilling, and other excavation.

C. Installation of anodes, cables, junction boxes and test stations.

D. Backfill and compaction of backfill.

E. Protective coating or wrap for metallic pipe, fittings, restraining devices, and appurtenances.

F. Dust alleviation and control.

G. Cleanup and restoration of surface in improved areas.

H. Supplying all labor, materials, equipment and apparatus not specifically mentioned herein or noted on the Drawings, but which are incidental and necessary to complete the Work specified.

I. All electrical equipment and materials and the design, construction and installation thereof shall comply with all applicable provisions of the National Electrical Code (NEC) and applicable local codes and regulations.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES:

1. Measurement for cathodic protection used is on a linear foot basis measured along the centerline of the pipe.

2. Refer to Section 01270 – Measurement and payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this

Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASSHTO – American Association of State Highway and Transportation Officials.

1. H20 – Specification for Highway Bridges.

B. ASTM – American Society for Testing and Materials.

1. B3 – Standard Specification for Soft or Annealed Copper Wire.

2. B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

3. B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes.

4. C94 – Standard Specification for Ready-Mixed Concrete.

5. D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

6. D2220 – Standard Specification for Polyvinyl Chloride (PVC) Insulation for Cable and Wire.

C. AWWA – American Water Works Association.

1. C213 – Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

2. C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.

D. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and payment for unit price procedures.

2. Section 01330 – Submittal procedures.

3. Section 02125 – Excavation and Backfill for Utilities.

E. IEEE – Institute of Electrical and Electronic Engineers.

F. IPCEA – Insulated Power Cable Engineers Association.

G. NACE – National Association of Corrosion Engineers.

1. RP0169 – Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

2. RP0286 – Electrical Insulation of Cathodically Protected Pipelines.

3. RP0375 – Wax Coating Systems for Underground Piping Systems.

4. TM0497 – Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping System.

H. NEMA – National Electrical Manufacturers Association.

I. OSHA – Occupational Safety and Health Administration.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit shop drawings and certification signed and sealed by a Professional Engineer registered in the State of Texas.

C. A complete list of cathodic protection equipment and material, including name and manufacturer, catalog number, size, finish and any other pertinent data necessary for proper identification and to establish conformance with these Technical Specifications.

D. The submitted data shall be marked with a clear indication of the Contractor's choice of the specific item or items, or class of items proposed, in order to establish written record of the Contractor's intent. A list of items indicating "as specified" shall not suffice.

1.5 QUALITY ASSURANCE

A. Cathodic protection components shall be new, of the highest quality, and standard products from a manufacturer regularly engaged in the production of such material or equipment. Bring all cathodic protection materials to the job site in original sealed containers. Cathodic protection components shall be subject to testing to ensure proper installation and operation. The Contractor shall correct all deficiencies and perform any required re-testing.

B. Brands or trade names are mentioned in these Technical Specifications to set standards of quality; use no substitute materials unless approved by the Project Manager in writing. Approval of substitute materials does not relieve the Contractor of responsibility for providing a workable and functioning system as designed.

PART II: PRODUCTS

2.1 ZINC GALVANIC ANODES

A. Galvanic anodes shall be zinc anodes having a Type II chemical composition conforming to the requirements of ASTM B418. Bare anode weight shall be as indicated on the Project Detail Sheets.

B. Anodes shall be cast with a galvanized steel core strap. One (1) end of the anode shall be recessed to provide access to the rod for connection of the lead wire. The lead wire shall be silver brazed to the rod, making a mechanically secure connection. The connection shall be insulated to a six hundred volt (600 V) rating by filling the recess with asphalt. The asphalt material shall be extended over the lead wire insulation by not less than one-half inch (1/2 In). The Contractor shall repair all damaged lead wire insulation as directed.

C. The entire soldered connection and core shall be sealed with epoxy. The zinc anode shall be prepackaged in a cloth bag containing a low resistivity backfill consisting of seventy-five percent (75%) hydrated gypsum, twenty percent (20%) bentonite and five percent (5%) sodium sulfate.

2.2 WIRE

A. Wires utilized for test stations shall be solid single conductor copper wire Type THHN insulation, No.10 AWG, as shown.

B. Wires for joint bonds shall be stranded single conductor copper wire Type HMW/PE insulation No. 8 AWG. Two (2) joint bonds shall be used for each joint.

C. All wire test leads and anode leads shall extend a minimum of eighteen inches (18 In) above grade after connection to the test station panel board.

2.3 PANEL BOARDS

A. Test station panel boards shall be made of four inch by four inch by one-fourth inch (4 In x 4 In x 1/4 In) fabric reinforced Micarta. Double-nutted nickel plated brass studs shall be installed on the panel boards

as shown on the Drawings. Tinned copper ring terminals shall be soldered to the ends of all wires terminated in the test station.

2.4 SHUNTS

A. Shunts for all sacrificial anode test stations shall be one hundredth ohm (0.01 Ω), six ampere (6 A) capacity, manganin wire type.

2.5 EXOTHERMIC WELD EQUIPMENT

A. Cable connections to pipe and fittings shall be made with exothermic weld kits specifically designed by the manufacturer for welding the types of materials and shapes indicated by each installation unless otherwise specified on the Drawings. Connections to ductile iron and cast iron pipe or fittings shall use the weld metal and mold for exothermic connections to cast iron pipe. The mold and weld metal shall be supplied by the same manufacturer. Weld metal shall be Type XF manufactured by Erico, Inc. or approved equal.

B. Exothermic weld equipment shall be as manufactured by "Cadweld" Erico Products, "Thermoweld" Continental Industries, Inc., or approved equal.

C. All welds shall be made utilizing copper wire sleeves and individual components shall not be interchanged between different manufacturers.

2.6 BITUMASTIC COATING

A. Bitumastic Coating shall be TC Mastic, as manufactured by Tapecoat Company; Bitumastic 50, as manufactured by Koppers Company, Inc., or an approved equal.

2.7 INSULATING FLANGE

A. Insulating flange gaskets shall be Neoprene-faced phenolic, suitable for the Work as indicated on the details shown on the Drawings. Sleeves shall be full length and of a material indicated by the manufacturer as suitable for domestic water. Flange bolts, nuts and washers shall be stainless steel and shall fit within the bolt facing of the flange.

B. Contractor shall provide two (2) sets of insulating washers which are one-eighth inch (1/8 In) thick laminated phenolic. Insulating washers shall fit within the bolt facing the flange over the outside diameter of the sleeve.

C. Insulating sleeves shall be spiral wound Mylar, one-thirty-second inch (1/32 In) thick.

D. Underground dielectric insulating flanges shall be covered with petrolatum wax tape.

2.8 PETROLATUM WAX TAPE SYSTEM (FOR ISOLATED FITTINGS AND ALL RESTRAINING DEVICES)

A. Petrolatum wax tape system for coating buried insulating flanges shall be Trenton Primer and #1 Wax-tape, as manufactured by Trenton Corp., or Denso Paste and Densyl Tape by Denso North America, Inc., or approved equivalent.

B. Petroleum Tape System Primer: Saturated petroleum hydrocarbon, non-drying, non-hardening.

C. Mastic: Saturated petroleum hydrocarbon, non-hardening, self-supporting compound.

D. Tape: Non-woven synthetic fabric, fully impregnated and coated with neutral petroleum-based compound.

E. Overwrap: Plasticized PVC tape with natural and synthetic rubber adhesive.

2.9 TEST STATION BOX

A. The traffic valve box for test stations shall be an H10 rated, G5 Utility Box as manufactured by Christy Concrete Products, Inc., or approved equal.

B. The traffic box covers for insulating test stations shall be cast iron with the legend "ANODE" as indicated on the Drawings.

2.10 COATING AND LINING

A. All cast-iron and steel valves, burys, spool pieces, flanged adapters, reducers, tees, crosses and other buried, ferrous metallic fittings, shall require a fusion epoxy coating and lining prepared from a one hundred percent (100%) dry epoxy resin applied by either the fluidizing bed method or electrostatically, in accordance with AWWA C213 for fittings and with AWWA C550 for valves. The minimum coating thickness shall be eight (8) mils and the maximum coating thickness shall be twenty-four (24) mils.

B. For valves, lining materials shall not be applied to valve stems, valve discs or parallel disc seats. Lining materials shall not be built up in thickness so as to interfere with joint assembly or with operation of the

valve being epoxy lined, and in any case, should not be greater than twelve (12) mils.

C. Inspection shall be carried out to determine the dry film thickness of the coating and or lining of each fitting. Any fitting not meeting this specification shall be replaced.

D. Holidays in the protective coating shall be repaired in the field as directed.

PART III: EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Refer to Section 02125 – Excavation and Backfill for Utilities.

3.2 FOREIGN STRUCTURE INTERFERENCE

A. Prevent electrical contact between the metallic pipe and/or fittings being cathodically protected and other existing buried metal structures at the time of the installation of the cathodic protection system. Where necessary, or required by the Project Manager, the Contractor shall install appropriately sized micarta sheeting, one-fourth inch (1/4 In) in thickness between the two (2) metallic surfaces.

3.3 INSULATED FLANGED JOINTS

A. Insulating components of each insulation flange kit shall be cleaned of all dirt, grease, oil, and other foreign materials immediately prior to assembly. Bolt holes in mating flanges shall be properly aligned at the time bolts and insulating sleeves are inserted to prevent damage to the insulation. After flange bolts have been tightened, each insulating washer shall be inspected and replaced by the Contractor if cracked or other damaged.

B. Install insulated flanged joints at flanges connecting above-ground installations, and at other locations shown on the Drawings.

3.4 JOINT BONDING

A. For metallic pipe, joint bond all non-welded rubber gasket joints, mechanical joints, and fusion epoxy coated flanged joints as indicated on the details shown on the Drawings to provide electrical continuity between all metallic sections of the facility to be protected.

B. All buried fusion-bonded epoxy coated pipe fittings shall be bonded for continuity. Joint bonds, for fusion-bonded epoxy coated pipe fittings

shall be installed with a wire loop extended above the bonded joint. The overall length of the conductor shall permit sufficient flexibility of each fitting across the joint without transferring any tensile stress to the bond cable. Cable to fitting connections shall be in conformance with these specifications. Coat all exposed surfaces of each fitting with liquid epoxy patch kit, as supplied by the pipe coating manufacturer.

3.5 EXOTHERMIC WELDS

A. Exothermic weld connections shall be installed in the manner and at the locations shown on the Drawings. Coating materials shall be removed from the surface over an area just sufficient to make the connection. The steel surface shall be cleaned to white metal by grinding or filing prior to welding the conductor. Resin impregnated grinding wheels shall not be allowed.

B. No connections to the structures or piping shall be buried until the Project Manager has inspected the connections and given permission to backfill. Connections made in violation of this provision shall be rejected.

C. Exothermic welds shall be tested by the Contractor for adherence to the pipe and for electrical continuity between the pipe and wires.

D. A twenty-two ounce (22 Oz) hammer shall be used for testing adherence by striking a blow to the weld. Take care to avoid hitting the wires.

E. After welding, coat all bonds with Bitumastic coating as directed. Protect all exposed wires and welds with Royston Handy Cap, or equal.

3.6 WIRES

A. Wires buried in the ground shall be laid straight, without kinks, and provide a minimum cover of twenty-four inches (24 In). Keep the bottom of the finished trench free from stones, roots or other materials that might injure the insulation of the conductors.

B. Each cable run shall be continuous in length and free of joints or splices, unless otherwise specified or shown on the Drawings. Care shall be used during installation to avoid punctures, cuts and similar damage to the insulation. Any damage to insulation shall require replacement of the entire cable length by Contractor. Copper ring terminals shall be crimped and soldered to the ends of the test leads, drain wires and anode leads terminated in the test station.

C. At least eighteen inches (18 In) of slack shall be left for each conductor

at each test station housing. Slack shall be that amount of wire which, when the cover is removed and the wire extended, protrudes beyond the opening of the box or enclosure. No wire bend shall have a radius of less than eight (8) times the diameter of that wire. Copper terminal rings sized for wire and stud shall be used to make all wire connections to terminal studs.

3.7 GALVANIC ZINC ANODES

A. Excavate a hole to a minimum of three inches (3 In) larger than the packaged sacrificial anode diameter, and to a depth one foot (1 Ft) below the fittings to be protected. Excavate the lead wire trench to the depth indicated on the details shown on the Drawings, and backfill in conformance with these Technical Specifications.

B. Exercise care to preclude damaging the cloth bag and lead wire insulation on the sacrificial anode. Do not lift or support anode by the lead wire. Plastic or paper bags shall be removed from the anode before lowering into the hole.

3.8 PETROLATUM WAX TAPE

A. Install per manufacturer's instructions.

B. Wire brush dirt and loose rust from substrate, apply primer by brush and work in to obtain a full film cover on substrate.

C. Install mastic to contour all sharp edges and irregular profiles.

D. Spirally apply tape with minimum fifty-five percent (55%) overlay smooth tape to exclude voids and seal overlaps.

3.9 ANODE TEST STATION

A. Anode test stations shall be installed at the locations shown or called for on the Drawings. Two (2) test leads shall be connected at the nearest pipe joint to the test station.

B. All connections of test lead wires to metal surfaces at the point of connection shall be cleaned by grinding or filing prior to welding the conductor. Cover finished connections with bitumastic.

C. Anode test station boxes shall be installed using a concrete collar satisfactory to prevent settlement. Set this concrete collar level and flush with the top of curb or finish grade.

D. No more than one (1) test station is allowed in each test station box.

3.10 SYSTEM TESTING

A. System testing shall be performed by the Project Manager, a Professional Engineer Licensed by the State of Texas or a qualified testing firm.

B. After installation of the sacrificial anode system, testing shall be conducted to verify proper operation of the cathodic protection system. This testing shall include, and not be limited to the following: bond continuity tests, sacrificial anode current output, pipe-to-soil potentials and other tests deemed necessary to verify proper operation of the systems.

C. Upon completion of testing, a detailed written report shall be submitted to the Contractor describing any deficiencies detected. All such deficiencies shall be corrected by the Contractor at no cost to the City.

D. Upon completion of any corrections or repairs, the system shall be re-tested.

END OF SECTION

SECTION 02300

CAST-IN-PLACE CONCRETE MANHOLES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cast-in-place concrete manholes for sanitary sewers and storm sewers, including box sewers.

B. Pile-supported concrete foundation used for unstable subgrade treatment for manhole base.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for manholes is on a unit price basis for each manhole installed.

2. Payment for Type C manhole with BB inlet top is on a unit price basis for each.

3. Payment for pile-supported concrete foundation used for unstable subgrade treatment for manhole base is on a unit price basis for each foundation installed.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASME American Society of Mechanical Engineers.

1. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM American Society for Testing and Materials.

1. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

2. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

3. ASTM C923 – Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

4. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic – Cement Grout (Nonshrink).

5. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3).

6. ASTM D2665 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

7. ASTM D2996 – Standard Specification for Filament-wound Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

8. ASTM D2997 – Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

C. AWWA – American Water Works Association.

1. AWWA C213 – Standard for Fusion Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines.

D. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02125 – Excavation and Backfill for Utilities.

4. Section 02315 – Frames, Grates, Rings and Covers.

5. Section 02525 – Acceptance Testing of Gravity Sanitary Sewer Lines.

6. Section 02905 – Topsoil.

7. Section 02910 – Hydromulch Seeding.

8. Section 02915 Sodding.

9. Section 03100 Mortar.

10. Section 03200 Reinforcing Steel.

11. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit proposed design mix and test data for each type and strength of concrete.

C. Submit manufacturer s data and details of following items for approval:

1. Frames, grates, rings and covers.

2. Materials to be used in fabricating drop connections.

3. Materials to be used for pipe connections at manhole walls.

4. Materials to be used for stubs and stub plugs.

5. Plugs to be used for sanitary sewer hydrostatic testing.

6. Installation instructions for forms.

D. Seal submittal drawings by a Professional Engineer licensed by the State of Texas.

PART II: PRODUCTS

2.1 CONCRETE

A. Conform to requirements of Section 03300 Structural Concrete.

B. Provide Class A concrete with minimum compressive strength of four thousand pounds per square inch (4000 psi) unless otherwise indicated on the Drawings.

2.2 REINFORCING STEEL

A. Conform to requirements of Section 03200 Reinforcing Steel.

2.3 MORTAR

A. Conform to requirements of Section 03100 Mortar.

2.4 MISCELLANEOUS METALS

A. Provide cast-iron frames, grates, rings and covers conforming to requirements of Section 02315 Frames, Grates, Rings and Covers.

2.5 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on the Drawings.

2.6 PIPE CONNECTIONS

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C923. Use the following materials for metallic mechanical devices as defined in ASTM C923:

a. External clamps: Type 304 stainless steel.

b. Internal, expandable clamps on standard manholes: Type 304 stainless steel, eleven (11) gauge minimum.

c. Internal, expandable clamps on corrosion-resistant manholes:

1) Type 316 stainless steel, eleven (11) gauge minimum.

2) Type 304 stainless steel, eleven (11) gauge minimum, coated with minimum sixteen (16) mil fusion bonded epoxy conforming to AWWA C213.

2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on the Drawings, provide polyethylene-isoprene waterstop meeting physical property requirements of ASTM C923, such as Pres-Seal WS Series or approved equal.

B. Storm Sewers.

1. Use non-shrink grout for storm sewer pipe connections to concrete manholes, unless otherwise shown on the Drawings. Pipe shall be flush with the inside wall of manhole. Grout pipe penetration in place on both inside and outside of manhole.

2.7 SEALANT MATERIALS

A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, such as Adeka Ultraseal P201 or approved equal.

B. Provide external sealing material from Canusa Wrapid Seal manhole encapsulation system or approved equal.

C. Butyl Sealant: Provide Press-Seal EZ Stick or equal, for HDPE rings.

2.8 CORROSION-RESISTANT MANHOLE MATERIALS

A. Where corrosion-resistant manholes or PVC-lined manholes are indicated on the Drawings, provide the following:

1. PVC liner for precast cylindrical manhole section, base sections and cone sections.

2.9 BACKFILL MATERIALS

A. Conform to the requirements of Section 02125 □ Excavation and Backfill for Utilities.

2.10 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based non-shrink grout requiring only addition of water.

B. Provide grout meeting requirements of ASTM C1107 and having minimum twenty-eight day (28 D) compressive strength of seven thousand pounds per square inch (7000 psi).

2.11 VENT PIPES

A. Provide external vent pipes for manholes where indicated on the Drawings.

B. Buried Vent Pipes: Provide three inch (3 In) or four inch (4 In) PVC Drain, Waste and Vent (DWV) pipe conforming to ASTM D2665. Alternatively, provide Fiberglas Reinforced Plastic (FRP) pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on the Drawings, constructed of following specified materials:

1. FRP Pipe: Provide filament-wound FRP conforming to ASTM D2996 or centrifugally cast FRP conforming to ASTM D2997. Seal cut ends in accordance with manufacturer's recommendations.

2. Joints and Fittings: Provide epoxy- bodied fittings and join pipe to fittings with epoxy adhesive, according to pipe manufacturer's instructions.

3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on the Drawings. Meet bolt pattern and dimensions for ASME B16.1, one hundred twenty-five pound (125 Lb) flanges. Use Type 304 stainless steel or hot-dip zinc coated, conforming to ASTM A 307, Class A or B flange bolts.

4. Coating: Provide two (2) component, aliphatic polyurethane coating, using primer or tie coat recommended by manufacturer. Provide two (2) or more coats to yield dry film thickness of at least three (3) mils. Provide Amershield, Tnemec 74 or approved equal. The Project Manager selects color from manufacturer's standard colors.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to ninety-five percent (95%) of maximum Standard Proctor Density according to ASTM D698 prior to placement of foundation material and base section. When proper density cannot be reached, condition subgrade until that density is reached or treat as an unstable subgrade.

C. Do not build manholes in ditches, swales or drainage paths unless approved by the Project Manager.

3.2 MANHOLES

A. Construct manholes to dimensions shown on the Drawings. Commence construction as soon as possible after pipes are laid. On monolithic sewers, construct manholes at same time sewer is being constructed.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify the Project Manager for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for twenty-four inch (24 In) thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation under manhole base, as detailed on the Drawings.

C. Cast manhole foundations and walls monolithically. Use cold joint with approved waterstop when manhole flow line depth exceeds twelve feet (12 Ft). No other joints shall be allowed unless shown on the Drawings. Wrap cold joints with external sealing material, minimum six inch (6 In) width.

D. For concrete containing micro silica admixtures, place, finish and cure concrete for manholes following procedures in Section 03300 Structural Concrete.

E. Top of manhole elevations shown on the Drawings are approximate, based on current pavement and natural ground conditions as determined from elevations measured on fifty foot (50 Ft) spacing. No additional payment shall be made if final elevation of manhole ring and cover is higher or lower due to requirements of finished grade or replaced pavement surface.

3.3 PIPE CONNECTIONS

A. Install approved resilient connectors at each pipe entering and exiting sanitary sewer manholes in accordance with manufacturer's instructions.

B. Grout storm sewer connections to manhole unless otherwise shown on the Drawings. Grout pipe penetrations both inside and outside of manhole. Pipes shall be flush with interior of the manhole.

C. Ensure no concrete, cement-stabilized sand, fill or other solid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on interior or exterior of manhole. When necessary, fill space with compressible material to ensure resilient connector shall maintain full flexibility where evidence of reduced flexibility is encountered.

D. Where new manhole is to be constructed on existing sewer, a rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe spring line using adhesive recommended and supplied by waterstop manufacturer.

1. Field verify the elevations of all manholes to be constructed on existing sewer before the start of any related work.

2. Failure to field verify existing conditions before start of work shall be the responsibility of the Contractor should the elevations not match and the work shall be completed with no additional cost to the City.

E. Do not construct joints on sanitary sewer pipe within wall sections of manholes. Use approved connection material.

F. Construct pipe stubs with resilient connectors for future connections at locations and with material indicated on the Drawings. Install approved stub plugs at interior of manhole.

G. Test connection for watertight seal before backfilling.

3.4 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: one inch per foot (1 In/Ft) minimum; one and one-half inch per foot (1-1/2 In/Ft) maximum.

2. Depth of bench to invert:

a. Pipes smaller than fifteen inches (15 In): one-half (1/2) of largest pipe diameter.

b. Pipes fifteen inches (15 In) to twenty-four inches (24 In): three-quarters (3/4) of largest pipe diameter.

c. Pipes larger than twenty-four inches (24 In): equal to largest pipe diameter.

3. Invert slope through manhole: one-tenth foot (0.1 Ft) drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on the Drawings.

B. Form invert channels with Class A concrete if not integral with manhole base. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.5 DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement-stabilized sand or Class A concrete to form solid mass. Extend cement-stabilized sand or concrete encasement minimum of four inches (4 In) outside bells.

B. Install connection when sewer line enters manhole higher than twenty-four inches (24 In) above invert of manhole.

3.6 STUBS FOR FUTURE CONNECTIONS

A. In manholes where future connections are indicated on the Drawings, install resilient connectors and pipe stubs with approved watertight plugs.

3.7 ADJUSTMENT RINGS AND FRAME

A. Combine precast concrete or HDPE adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with non-shrink grout; do not use mortar between adjustment rings. Apply latex-based bonding agent to precast concrete surfaces to be joined with non-shrink grout. Set cast iron frame on adjustment ring in a bed of approved sealant material. Install a sealant bed consisting of two (2) beads of sealant, each bead having minimum dimensions of one-half inch (1/2 In) and one-half inch (1/2 In) wide.

B. Wrap manhole frame and adjustment rings with external sealing material, minimum three inches (3 In) beyond joint between ring and frame and ring and precast section.

C. For manholes in unpaved areas, set top of frame a minimum of six inches (6 In) above existing ground line unless otherwise indicated on the Drawings. Encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded corner around perimeter.

D. For Manholes in paved areas, set manhole cover is flush with surrounding pavement. Form a six foot by six foot (6 Ft x 6 Ft) area, full depth to subgrade and parallel to the roadway centerline, centered on the manhole. Install expansion joint material on the perimeter of the form. Install reinforcing bar and concrete typical of road paving. Ensure that manhole is flush with surrounding pavement before applying final finish and curing compound.

3.8 BACKFILL

A. After concrete obtains adequate strength, place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Section 02125 Excavation and Backfill for Utilities. Use embedment zone backfill material for adjacent utilities, as shown in City of Friendswood Standard Details over each pipe connected to manhole. Provide trench zone backfill, as specified for adjacent utilities, above embedment zone backfill.

B. Where rigid joints are used for connecting existing sewers to manhole, backfill under existing sewer up to spring line of pipe with Class A concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of four inches (4 In) of topsoil conforming to requirements of Section 02905 Topsoil. Seed in accordance with Section 02910 Hydromulch Seeding or sod disturbed areas in accordance with Section 02915 Sodding.

3.9 FIELD QUALITY CONTROL

A. Conduct leakage testing of Sanitary Sewer manholes in accordance with requirements of Section 02525 Acceptance Testing of Gravity Sanitary Sewer Lines.

3.10 PROTECTION

A. Protect manholes from damage until subsequent Work has been accepted. Repair or replace damaged elements of manholes at no additional cost to City.

B. Damaged manholes that have been repaired or replaced shall be retested at no additional cost to the City.

END OF SECTION

SECTION 02305

PRECAST CONCRETE MANHOLES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Precast concrete manholes for sanitary sewers and storm sewers.

B. Precast concrete sanitary sewer manholes with PVC liner where corrosion resistant manholes are specifically indicated in the Drawings.

C. Pile-supported concrete foundation used for unstable subgrade treatment for manhole base.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for normal depth manholes, up to eight feet (8 Ft) deep, is on a unit price basis for each manhole installed. Manhole depth is measured from top of cover to sewer invert. Air release manhole depth is measured from top of cover to inside base for air release or vacuum release manholes.

2. Payment for shallow depth manholes is on a unit price basis for each manhole installed. Shallow manholes have a depth of five feet (5 Ft) or less measured from top of cover to sewer invert.

3. Payment for extra depth manholes is on a unit price basis per vertical foot for each foot of depth greater than eight feet (8 Ft). Sewer manhole depth is measured from top of cover to sewer invert. Air release manhole depth is measured from top of cover to inside base for air release or vacuum release manholes.

4. Payment for normal depth corrosion resistant manholes is on a unit price basis for each manhole installed.

5. Payment for standard manhole drops is on a unit price basis for each drop installed. Standard manhole drops include both internal and external drops.

6. Payment for watertight manholes, including external vent pipe is on a unit price basis for each.

7. Payment for air-release manhole with valves and fittings installed is on a unit price basis for each manhole with air-release valves and fittings installed.

8. Payment for pile-supported concrete foundation used for unstable subgrade treatment for manhole base is on a unit price basis for each foundation installed.

9. Payment for sanitary sewer manholes shall be authorized when manhole has been tested as specified in Section 02525 Acceptance Testing of Gravity Sanitary Sewer Lines.

10. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO American Association of State Highway and Transportation Officials.

B. ASME American Society of Mechanical Engineers.

1. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings.

C. ASTM American Society for Testing and Materials.

1. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

2. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C270 Standard Specification for Mortar for Unit Masonry.

4. ASTM C443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

5. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections.

6. ASTM C923 – Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

7. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

8. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3).

9. ASTM D2665 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

10. ASTM D2996 – Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

11. ASTM D2997 – Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

D. AWWA – American Water Works Association.

1. AWWA C213 – Standard for Fusion Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines.

E. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01630 – Product Substitution.

4. Section 02125 – Excavation and Backfill for Utilities.

5. Section 02145 – Cement-Stabilized Sand.

6. Section 02315 – Frames, Grates, Rings and Covers.

7. Section 02525 – Acceptance Testing of Gravity Sanitary Sewer Lines.

8. Section 02905 Topsoil.

9. Section 02910 Hydromulch Seeding.

10. Section 02915 Sodding.

11. Section 03100 Mortar.

12. Section 03200 Reinforcing Steel.

13. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturers data and details of following items for approval:

1. Shop drawings of manhole sections, base units and construction details, including reinforcement, jointing methods, materials and dimensions.

2. Summary of criteria used in manhole design including as a minimum; material properties, loadings, load combinations and dimensions assumed. Include certification from manufacturer that precast manhole design is in full accordance with ASTM C478 and design criteria as established in Paragraph 2.1.E of this Specification.

3. Frames, grates, rings and covers.

4. Materials to be used in fabricating drop connections.

5. Materials to be used for pipe connections at manhole walls.

6. Materials to be used for stubs and stub plugs, if required.

7. Materials and procedures for corrosion-resistant liner and coatings, if required.

8. Plugs to be used for sanitary sewer hydrostatic testing.

9. Manufacturers data for pre-mix (bag) concrete, if used for channel inverts and benches.

C. Seal submittal drawings by a Professional Engineer licensed by the

State of Texas.

PART II: PRODUCTS

2.1 PRECAST CONCRETE MANHOLES

A. Provide manhole sections, base sections and related components conforming to ASTM C478. Provide base riser section with integral floors, unless shown otherwise. Provide adjustment rings which are standard components of manufacturer of manhole sections. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.

B. Construct barrels for precast manholes from standard reinforced concrete manhole sections of diameter indicated on the Drawings. Use various lengths of manhole sections in combination to provide correct height with fewest joints. Design wall sections for depth and loading conditions in Paragraph 2.1.E, with minimum thickness of five inches (5 In). Base section shall have minimum thickness of twelve inches (12 In) under invert.

C. Provide tops to support HS-20 vehicle loading and receive cast iron frame covers, as indicated on the Drawings.

D. Where manholes larger than forty-eight inch (48 In) diameter are indicated on the Drawings, provide precast base sections with flat slab top precast sections used to transition to forty-eight inch (48 In) diameter manhole access riser sections. Transition can be concentric or eccentric unless otherwise shown on the Drawings. Locate transition to provide minimum of seven foot (7 Ft) head clearance from base to underside of transition unless otherwise approved by the Project Manager.

E. Design Loading Criteria: Manhole walls, transition slabs, cone tops and manhole base slab shall be designed, by manufacturer, to requirements of ASTM C478 for depth as shown on the Drawings and to resist following loads.

1. AASHTO HS-20 vehicle loading applied to manhole cover and transmitted down to transition and base slabs.

2. Unit soil weight of one hundred twenty pounds per cubic foot (120 pcf) located above portions of manhole, including base slab projections.

3. Lateral soil pressure based on saturated soil conditions producing an at-rest equivalent fluid pressure of one hundred pounds per cubic foot (100 pcf).

4. Internal liquid pressure based on unit weight of sixty-three pounds per cubic foot (63 pcf).

5. Dead load of manhole sections fully supported by transition and base slabs.

F. Design: Manhole walls, transition slabs, cone tops and manhole base slab shall be designed according to requirements of ASTM C478 and following:

1. Design additional reinforcing steel to transfer stresses at openings. Area of steel to be no less than shown on the Drawings.

2. Wall loading conditions:

a. Saturated soil pressure acting on empty manhole.

b. Manhole filled with liquid to a halfway depth as measured from invert to cover, with no balancing external soil pressure.

3. Minimum clear distance between two (2) wall penetrations shall be twelve inches (12 In) or half diameter of smaller penetration, whichever is greater.

G. Provide joints between sections with O-ring gaskets conforming to ASTM C443.

H. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.

I. Precast Concrete Base: Suitable cutouts or holes to receive pipe and connections.

2.2 CONCRETE

A. Conform to requirements of Section 03300 Structural Concrete.

B. Channel Inverts: Use five (5) sack premix (bag) concrete or Class A concrete for inverts not integrally formed with manhole base, with minimum compressive strength of four thousand pounds per square

inch (4000 psi).

C. Cement-Stabilized Sand Foundation: Provide cement-stabilized sand foundation under base section in lieu of foundation slab, as shown on the Drawings, conforming to requirements of Section 02145 Cement-Stabilized Sand.

D. Concrete Foundation: Provide Class A concrete with minimum compressive strength of four thousand pounds per square inch (4000 psi) for concrete foundation slab under manhole base section where indicated on the Drawings.

2.3 REINFORCING STEEL

A. Conform to requirements of Section 03200 Reinforcing Steel.

2.4 MORTAR

A. Conform to requirements of Section 03100 Mortar.

2.5 MISCELLANEOUS METALS

A. Provide cast-iron frames, rings and covers conforming to requirements of Section 02315 Frames, Grates, Rings and Covers.

2.6 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on the Drawings.

2.7 PIPE CONNECTIONS TO MANHOLE

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C923. Use the following materials for metallic mechanical devices as defined in ASTM C923:

a. External clamps: Type 304 stainless steel.

b. Internal, expandable clamps on standard manholes: Type 304 stainless steel, eleven (11) gauge minimum.

c. Internal, expandable clamps on corrosion-resistant manholes:

1) Type 316 stainless steel, eleven (11) gauge minimum.

2) Type 304 stainless steel, eleven (11) gauge minimum, coated with minimum sixteen (16) mil fusion-bonded epoxy conforming to AWWA C213.

2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on the Drawings, provide polyethylene-isoprene water-stop meeting physical property requirements of ASTM C923, such as Press-Seal WS Series or approved equal.

B. Storm Sewer Connections:

1. Provide watertight connections in accordance with ASTM C923.

2.8 SEALANT MATERIALS

A. Approved products in accordance with Section 01630 Product Substitution.

B. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, Adeka Ultraseal P201 or approved equal.

C. Provide approved external sealing material from Canusa Wrapid Seal manhole encapsulation system or approved equal.

D. Provide Butyl Sealant: Provide Press-Seal EZ Stick or equal, for HDPE rings.

2.9 CORROSION RESISTANT MANHOLE MATERIALS

A. Where corrosion-resistant manholes or PVC-lined manholes are indicated on the Drawings, provide one of following:

1. PVC liner for precast cylindrical manhole section, base sections and cone sections.

2.10 BACKFILL MATERIALS

A. Conform to requirements of Section 02125 Excavation and Backfill for Utilities.

2.11 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.

B. Meet requirements of ASTM C1107 and have minimum twenty-eight day (28 D) compressive strength of seven thousand pounds per square inch (7000 psi).

2.12 VENT PIPES

A. Provide external vent pipes for manholes where indicated on the Drawings.

B. Buried Vent Pipes: Provide three inch (3 In) or four inch (4 In) PVC Drain, waste and Vent (DWV) pipe conforming to ASTM D2665. Alternatively, provide Fiberglass Reinforced Plastic (FRP) pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on the Drawings, constructed of following specified materials:

1. FRP Pipe: Provide filament wound FRP conforming to ASTM D2996 or centrifugally cast FRP conforming to ASTM D2997. Seal cut ends in accordance with manufacturer's recommendations.

2. Joints and Fittings: Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive.

3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on the Drawings. Meet bolt pattern and dimensions for ASME B16.l, one hundred twenty-five pound (125 Lb) flanges. Flange bolts shall be Type 304 stainless steel or hot-dip zinc coated, conforming to ASTM A307, Class A or B.

4. Coating: Provide approved two (2) component, aliphatic polyurethane coating using primer or tie coat recommended by manufacturer. Provide two (2) or more coats to yield dry film thickness of at least three (3) mils. Color shall be selected by the Project Manager from manufacturer's standard colors.

2.13 PROHIBITED MATERIALS

A. Do not use brick masonry for construction of sanitary sewer manholes

or storm sewer manholes, including adjustment of manholes to grade. Use only specified materials listed above.

PART III: E X E C U T I O N

3.1 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to ninety-five percent (95%) of maximum Standard Proctor Density according to ASTM D698 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.

C. Do not build manholes in ditches, swales or drainage paths unless approved by the Project Manager.

3.2 PLACEMENT

A. Install precast manholes to conform to locations and dimensions shown on the Drawings.

B. Place sanitary and storm manholes at points of change in alignment, grade, size, pipe intersections and end of sewer unless otherwise shown on the Drawings.

3.3 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Place precast base on twelve inch (12 In) thick (minimum) foundation of crushed stone wrapped in filter fabric, cement-stabilized sand or concrete foundation slab. Compact cement-stabilized sand in accordance with requirements of Section 02145 □ Cement-Stabilized Sand.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify the Project Manager for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for twenty-four inch (24 In) thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on the Drawings, under manhole base.

3.4 PRECAST MANHOLE SECTIONS

A. Install sections, joints and gaskets in accordance with manufacturer's printed recommendations.

B. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.

C. Seal any lifting holes with non-shrink grout.

D. Where PVC liners are required, seal joints between sections in accordance with manufacturer's recommendations.

E. Place at least two (2) precast concrete grade rings with thickness of twelve inches (12 In) or less, under casting.

3.5 PIPE CONNECTIONS AT MANHOLES

A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

1. Where smooth exterior pipes, i.e. steel, ductile iron or PVC pipes are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier. Assemblies: "Press-Wedge," "Res-Seal," "Thunderline Link-Seals," or approved equal. See the Drawings for placement of assembly in manhole sections.

2. When connecting concrete or cement mortar coated steel pipes or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: Minimum of nine-sixteenths inch (9/16 In) wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

B. Grout storm sewer connections to manhole unless otherwise shown on the Drawings. Grout pipe penetration in place on both inside and outside of manhole. Pipes are to be flush with interior of the manhole.

C. Ensure no concrete, cement-stabilized sand, fill or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility

provided by resilient connector.

D. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe springline using an adhesive recommended and supplied by waterstop manufacturer.

1. Field verify the elevations of all manholes to be constructed on existing sewer before the start of any related work.

2. Failure to field verify existing conditions before start of work shall be the responsibility of the Contractor should elevations not match and the work shall be completed with no additional cost to the City.

E. Test connection for watertight seal before backfilling.

F. All connection to existing manholes shall be core drilled. Making openings to existing manholes by any other means shall not be accepted.

3.6 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: one inch per foot (1 In/Ft) minimum; one and one-half inches per foot (1-1/2 In/Ft) maximum.

2. Depth of bench to invert:

a. Pipes smaller than fifteen inches (15 In): one-half (1/2) of largest pipe diameter.

b. Pipes fifteen inches (15 In) to twenty-four inches (24 In): three-quarters (3/4) of largest pipe diameter.

c. Pipes larger than twenty-four inches (24 In): equal to largest pipe diameter.

3. Invert slope through manhole: one-tenth foot (0.1 Ft) drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on the Drawings.

B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.7. DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement-stabilized sand or Class A concrete to form solid mass. Extend cement-stabilized sand or concrete encasement minimum of four inches (4 In) outside bells.

B. Install drop connection when sewer line enters manhole higher than twenty-four inches (24 In) above invert of manhole.

3.8 STUBS FOR FUTURE CONNECTIONS

A. In manholes, where future connections are indicated on the Drawings, install resilient connectors and pipe stubs with approved watertight plugs.

3.9 MANHOLE FRAME AND ADJUSTMENT RINGS

A. Combine precast concrete or HDPE adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with non-shrink grout; do not use mortar between adjustment rings. Apply latex-based bonding agent to precast concrete surfaces joined with non-shrink grout. Set cast iron frame on adjustment ring in bed of approved sealant material. Install sealant bed consisting of two (2) beads of sealant, each bead having minimum dimensions of one-half inch (1/2 In) and one-half inch (1/2 In) wide.

B. Wrap manhole frame and adjustment rings with external sealing material, minimum three inches (3 In) beyond joint between ring and frame and adjustment rings and precast section.

C. For manholes in unpaved areas, set top of frame a minimum of six inches (6 In) above existing ground line unless otherwise indicated on the Drawings. In unpaved areas, encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded corner around perimeter.

3.10 BACKFILL

A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Section 02125 Excavation and Backfill for Utilities. Provide embedment zone backfill material, as specified for adjacent utilities, from manhole foundation up to an elevation twelve inches (12 In) over each pipe connected to manhole. Provide trench zone backfill, as specified for adjacent utilities, above embedment zone backfill.

B. Where rigid joints are used for connecting existing sewers to manhole, backfill under existing sewer up to springline of pipe with Class B concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of four inches (4 In) of topsoil conforming to requirements of Section 02905 Topsoil. Seed in accordance with Section 02910 Hydromulch Seeding. When shown on the Drawings, sod disturbed areas in accordance with Section 02915 Sodding.

D. For Manholes in paved areas, set manhole cover is flush with surrounding pavement. Form a six foot by six foot (6 Ft x 6 Ft) area, full depth to subgrade and parallel to the roadway centerline, centered on the manhole. Install expansion joint material on the perimeter of the form. Install reinforcing bar and concrete typical of road paving. Ensure that manhole is flush with surrounding pavement before applying final finish and curing compound.

3.11 FIELD QUALITY CONTROL

A. Conduct leakage testing of sanitary sewer manholes in accordance with requirements of Section 02525 Acceptance Testing of Gravity Sanitary Sewer Lines.

3.12 PROTECTION

A. Protect manholes from damage until work has been accepted. Repair damage to manholes at no additional cost to the City.

B. Damaged manholes that have been repaired or replaced shall be retested at no additional cost to the City.

END OF SECTION

SECTION 02310

ADJUSTING MANHOLES, INLETS AND VALVE BOXES TO GRADE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Adjusting elevation of manholes, inlets and valve boxes to new grades.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for adjusting inlets and valve boxes to grade for new construction under this Section. Include payment in the unit price for related item.

2. Payment for adjusting existing manhole and frame and cover to new grade is on a unit price basis for each manhole and frame and cover.

3. Payment for adjusting existing utility structures to grade is on unit price basis for each:

   a. Inlet adjusted.

   b. Valve box adjusted.

   c. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02120 Excavation and Backfill for Structures.

4. Section 02300 Cast-In-Place Concrete Manholes.

5. Section 02305 Precast Concrete Manholes.

6. Section 02315 Frames, Grates, Wings and Covers.

7. Section 02605 Cast-In-Place Inlets, Headwalls and Wingwalls.

8. Section 02610 Precast Concrete, Inlets, Headwalls and Wingwalls.

9. Section 02615 Concrete Brick Manholes for Storm Sewers.

10. Section 02905 Topsoil.

11. Section 02910 Hydromulch Seeding.

12. Section 02915 Sodding.

13. Section 03100 Mortar.

14. Section 03300 Structural Concrete.

PART II: PRODUCTS

2.1 CONCRETE MATERIALS

A. Provide concrete, conforming to requirements of Section 03300 Structural Concrete.

B. Provide precast concrete manhole sections and adjustment rings conforming to requirements of Section 02305 Precast Concrete Manholes.

C. Provide mortar conforming to requirements of Section 03100 Mortar.

2.2 CAST-IRON MATERIALS

A. Provide cast-iron materials conforming to requirements of Section 02315 Frames, Grates, Rings and Covers.

2.3 PIPING MATERIALS

A. For riser pipes and fittings, refer to all Sections from Section 02200 to Section 02280.

2.4 MASONRY MATERIALS FOR STORM SEWER MANHOLES AND INLETS

A. Provide concrete brick masonry units.

PART III: EXECUTION

3.1 EXAMINATION

A. Examine existing structure, valve box, frame and cover or inlet box, frame and cover or inlet, piping and connections for damage or defects affecting adjustment to grade. Report damage or defects to the Project Manager.

3.2 ESTABLISHING GRADE

A. Coordinate grade-related items with existing grade and finished grade or paving and relate to established bench mark or reference line.

3.3 ADJUSTING MANHOLES AND INLETS

A. Curb and Gutter Streets.

1. Manholes and inlets in the paving shall have top of ring matching top of surrounding pavement.

2. Manholes and inlets within five feet (5 Ft) of the back of curb shall have top of ring a minimum of three inches (3 In) above the top of the nearest adjacent curb.

3. All other manholes and inlets shall be three inches (3 In) above finished grade. In new development where finish grade has not been established, manhole shall be six inches (6 In) above rough grade.

B. Open Ditch Streets.

1. Manholes and inlets in the paving shall have top of ring matching top of surrounding pavement.

2. Manholes and inlets between edge of pavement and top of

ditch bank shall be one inch (1 In) above adjacent finished grade.

3. Manholes and inlets at any location in ditch shall be a minimum of three inches (3 In) above the highest top of ditch bank.

4. All other manholes and inlets shall be three inches above finished grade. In new development where finish grade has not been established, manhole shall be six inches (6 In) above rough grade.

C. Manholes in ditches shall be a minimum of three inches above the elevation at the center of the road.

D. Rebuild adjustment portion of manhole or inlet by adding or removing Adjustments. Follow procedures for the type of structure being adjusted detailed in the following Sections:

1. Section 02300 Cast-In-Place Concrete Manholes.

2. Section 02305 Precast Concrete Manholes.

3. Section 02605 Cast-In-Place Inlets, Headwalls and Wingwalls.

4. Section 02610 Precast Concrete, Inlets, Headwalls and Wingwalls.

5. Section 02615 Concrete Brick Manholes for Storm Sewers.

E. Salvage and reuse cast-iron frame and cover or grate.

F. Protect or block off manhole or inlet bottom using wood forms shaped to fit so that no debris or soil falls to bottom during adjustment.

G. Verify that manholes and inlets are free of visible leaks as result of reconstruction. Repair leaks in manner subject to the Project Manager s approval.

3.4 ADJUSTING VALVE BOXES

A. Salvage and reuse valve box and surrounding concrete block as approved by the Project Manager. No separate pay.

B. Remove and replace six inch (6 In) ductile iron riser pipe with suitable length for depth of cover required to establish adjusted elevation to

accommodate actual finish grade.

C. Reinstall valve box and riser piping plumbed in vertical position. Provide minimum six inches (6 In) telescoping freeboard space between riser pipe top butt end and interior contact flange of valve box for vertical movement damping.

D. After valve box has been set, aligned and adjusted so that top lid is level with final grade.

3.5 BACKFILL AND GRADING

A. Backfill area of excavation surrounding each adjusted manhole, inlet and valve box and compact according to requirements of Section 02120 Excavation and Backfill for Structures.

B. Grade ground surface to drain away from each manhole and valve box. Place earth fill around manholes to level of upper rim of manhole frame. Place earth fill around valve box concrete slab.

C. In unpaved areas, grade surface at uniform slope of one to five (1:5) from manhole frame to natural grade. Provide minimum of four inches (4 In) of topsoil conforming to requirements of Section 02905 Topsoil. Provide seeding in accordance with Section 02910 Hydromulch Seeding or if sodding in accordance with Section 02915 Sodding.

END OF SECTION

SECTION 02315

FRAMES, GRATES, RINGS and COVERS

PART I: GENERAL

1.1 GENREAL REQUIREMENTS

A. Iron castings for manhole frames and covers.

B. Inlet frames and grates.

C. Catch basin frames and grates.

D. Meter vault frames and covers.

E. Adjustment of rings and extensions.

F. Ring grates.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No payment shall be made for frames, grates, rings, covers and seals under this Section. Include payment in the unit price for related item.

2. Payment to rack over existing manhole is on a unit price basis for each manhole.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO □ American Association of State Highway Officials.

1. AASHTO Standard Specification for Highway Bridges.

B. ASTM American Society for Testing and Materials.

1. ASTM A48 Standard Specification for Gray Iron Castings.

2. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. AWS American Welding Society.

1. AWS D12.1 Welding Reinforcing Steel.

D. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit copies of manufacturer s specifications, load tables, dimension diagrams, anchor details and installation instructions.

C. Submit shop drawings for fabrication and installation of casting assemblies that are not included in the Drawings or City of Friendswood Standard Details. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART II: PRODUCTS

2.1 CASTINGS

A. Use castings for frames, grates, rings and covers conforming to ASTM A48, Class 35B. Provide locking covers if indicated on the Drawings.

B. Use clean castings capable of withstanding application of AASHTO M306- forty thousand pound (40000 Lb) proof loading without detrimental permanent deformation.

C. Fabricate castings to conform to shapes, dimensions and with wording or logos shown on the Drawings. Standard dimensions for manhole covers are thirty-two inches (32 In) in diameter. Twenty-four inch (24

In) diameter is acceptable for curb inlets only.

D. Use clean castings, free from blowholes and other surface imperfections. Use clean and symmetrical cast holes in covers, free of plugs.

2.2 BEARING SURFACES

A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

2.3 SPECIAL FRAMES AND COVERS

A. Where indicated on the Drawings, provide watertight manhole frames and covers with minimum of four (4) bolts and gasket designed to seal cover to frame. Supply approved watertight manhole covers and frames.

B. Where shown on the Drawing, provide manhole frames and covers with forty-eight inch (48 In) diameter clear opening, with inner cover for twenty-two inch (22 In) diameter clear opening. Provide approved inner cover with pattern shown on the Drawings.

2.4 FINISH

A. Unless otherwise specified, use uncoated coat iron.

2.5 FABRICATED RING GRATES

A. Fabricate ring grates from reinforcing steel conforming to ASTM A615.

B. Conform to welds connecting bars to AWS D12.1.

2.6 ADJUSTMENT RINGS FOR ASPHALT OVERLAYS

A. Use castings conforming to Paragraph 2.1.

B. One (1) piece casting with dimensions to fit frame and cover.

PART III: EXECUTION

3.1 INSTALLATION

A. Install castings according to approved shop drawings, instructions in

related specifications and applicable directions from manufacturer's printed materials.

B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.

C. Fabricate ring grates in accordance with City of Friendswood Standard Detail, "Ring Grate for Open End of eighteen inch (18 In) to seventy-two inch (72 In) Stubs to Ditch". Set in mortar in mouth of pipe bell.

D. Install adjustment rings in existing frames with clean bearing surfaces that are free from rocking.

END OF SECTION

SECTION 02400

WATER LINES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Installation of water lines.

B. Technical Specifications identify requirements for both small diameter water lines and large diameter water lines. When Technical Specifications for large diameter water lines differ from those for small diameter water lines, large diameter Technical Specifications shall govern for large diameter pipe.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for water lines installed by open-cut, augered with or without casing, aerial crossing and pipe offset section or within limits of Potentially Petroleum Contaminated Area (PPCA) is on linear foot basis for each size of pipe installed. Separate pay items are used for each type of installation.

   a. Mains: Measure along axis of pipe and include fittings and valves.

   b. Branch Pipe: Measure from axis of water line to end of branch.

2. Payment for interconnection is on lump sum basis for each interconnection identified on the Drawings. Payment shall include tapping sleeve and valves piping, connections and other related work necessary for construction as shown on the Drawings or specified herein.

3. Payment for removal of existing internal elliptical or dished head plug is on unit price basis for each internal elliptical or dished head plug removed. Payment shall include deletion of plug, drainage or dewatering of water lines, repair of damaged linings, rechlorination and items incidental to operation.

4. Payment for plug and clamp is on a unit price basis for each size of pipe.

5. Payment for drainline connection with service manhole is on unit price basis for each drainline shown on drawings. Payment includes valve, access manhole and connection.

6. Payment for cylindrical corrosion barriers is on a unit price basis for each pipe fitting installed with one or more barriers.

7. When directed by the Project Manager to install extra fittings as required to avoid unforeseen obstacles, payment shall be based on the following:

   a. Each extra fitting requested by the Project Manager and delivered to jobsite shall be paid according to unit price bid for "Extra Fittings in Place."

   b. Payment shall include and be full compensation for items necessary for installation and operation of water line.

8. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ANSI American National Standards Institute.

1. ANSI A21.11/AWWA C111 Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

2. ANSI/NSF Standard 61 Drinking Water System -Health Components.

B. ASTM American Society for Testing and Materials.

1. ASTM A36 Standard Specification for Carbon Structural Steel.

2. ASTM A126 Standard Specification for Gray Iron Castings for

Valves, Flanges and Pipe Fittings.

3. ASTM A536 Standard Specification for Ductile Iron Castings.

4. ASTM B21 Standard Specification for Naval Brass Rod, Bar and Shapes.

5. ASTM B98 Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.

6. ASTM B301 Standard Specification for Free-Cutting Copper Rod and Bar.

7. ASTM B584 Standard Specification for Copper Alloy Sand Casting for General Application.

8. ASTM E165 Standard Test Method for Liquid Penetrant Examination.

9. ASTM E709 Standard Guide for Magnetic Particle Examination.

10. ASTM F1674 Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

C. AWWA American Water Works Association.

1. AWWA C206 Standard for Field Welding of Steel Water Pipe.

2. AWWA C207 Standard for Steel Pipe Flanges for Waterworks Service Sizes 4 Inches through 144 Inches.

3. AWWA C508 Standard for Swing-Check Valves for Waterworks Service, 2 IN. through 24 IN. NPS.

D. CFTS City of Friendswood Technical Specifications.

1. Section 01110 Summary of Work.

2. Section 01270 Measurement and Payment.

3. Section 01320 Construction Photographs.

4. Section 01330 Submittal Procedures.

5. Section 01745 Site Restoration.

6. Section 02125 Excavation and Backfill for Utilities.

7. Section 02140 Utility Backfill Materials.

8. Section 02200 Bar Wrapped Steel Cylinder Pipe.

9. Section 02215 Ductile Iron Pipe (DIP) and Fittings.

10. Section 02225 Prestressed Concrete Cylinder Pipe (PCCP).

11. Section 02235 Polyvinyl Chloride Pipe (PVC).

12. Section 02250 Steel Pipe and Fittings.

13. Section 02255 Steel Pipe and Fittings for Large Diameter Water Lines.

14. Section 02260 Polyethylene Wrap.

15. Section 02270 Augering for Water Pipe and Conduit.

16. Section 02285 Cathodic Protection.

17. Section 02450 Hydrostatic Testing of Waterlines.

18. Section 02455 Disinfection of Waterlines.

19. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Conform to submittal requirements of applicable Section for type of pipe used.

C. Photographs: Submit photographs conforming to requirements of Section 01320 Construction Photographs prior to commencement of construction.

D. Submit One Call notification transmittal number(s) prior to beginning excavation.

E. Submit, a minimum of fifteen days (15 D) before beginning pipe laying operations, layout drawing(s) identifying proposed sections for

disinfecting, hydrostatic testing and site restoration for entire project for review and approval. Layout drawing(s) to identify sequence of sections for:

1. Disinfection; not to exceed four thousand linear feet (4000 Lf) per section.

2. Hydrostatic testing and transfer of services; to immediately follow sequence of disinfected section.

3. Site restoration; not to exceed limits specified; Sequence in order of disturbance.

PART II: PRODUCTS

2.1 PIPE MATERIALS

A. Install pipe materials which conform to following:

1. Section 02215 Ductile Iron Pipe (DIP) and Fittings.

2. Section 02250 Steel Pipe and Fittings. Water line piping within plant site and aerial crossings to be welded joint steel pipe with flange or approved restraint joint connections, unless otherwise shown on the Drawings.

3. Section 02235 Polyvinyl Chloride Pipe (PVC).

4. Section 02225 Prestressed Concrete Cylinder Pipe (PCCP).

5. Section 02255 Steel Pipe and Fittings for Large Diameter Water Lines.

6. Section 02200 Bar Wrapped Steel Cylinder Pipe.

B. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have certified by an organization accredited by ANSI.

C. Type of pipe materials used is Contractor's option unless specifically identified on the Drawings.

D. Provide minimum of three-eighths inch (3/8 In) inside joint recess between ends of pipe in straight pipe sections.

2.2 WELDED JOINT PROTECTION FITTING FOR SMALL DIAMETER STEEL PIPE

A. Cylindrical Corrosion Barrier: Provide approved cylindrical corrosion barrier.

B. O-rings: Conform to National Sanitary Foundation requirements.

2.3 RESTRAINED JOINTS

A. Ductile Iron Pipe (DIP): See Section 02215 Ductile Iron Pipe (DIP) and Fittings.

B. PVC Pipe: See Section 02235 Polyvinyl Chloride Pipe (PVC). Perform hydrostatic testing in accordance with ASTM F1674.

C. Prestressed Concrete Cylinder Pipe (PCCP), Bar-Wrapped Pipe and Steel Pipe: Welded joints (see Paragraph 3.6 D).

D. Restrained Joints where required on DIP and PVC pipe:

1. Restraint devices: Manufacture of high strength ductile iron, ASTM A536 up to twenty-four inches (24 In) and ASTM A36 for sizes greater than thirty inches (30 In). Working pressure rating twice that of design test pressure.

2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

2.4 COUPLINGS AND APPURTENANCES FOR LARGE DIAMETER WATERLINE

A. Flexible (Dresser-type) Couplings.

1. Install where shown on the Drawings or where allowed by the Project Manager for the Contractor's convenience. Use galvanized flexible couplings when installed on galvanized pipe which is cement lined or when underground. Provide gaskets manufactured from Neoprene or Buna-N.

2. For steel pipe; provide approved sleeve-type flexible couplings. Thickness of middle ring equal to or greater than thickness of pipe wall.

3. Provide approved flanged adapter couplings for steel pipe.

4. Use Type 316 stainless steel bolts, nuts and washers where flexible couplings are installed underground. Coat entire coupling with twenty (20) mil of approved coal tar coating.

B. Flap Valves: Provide approved flap valves on discharge of manhole drainline as shown on the Drawings.

1. Body and Flap: ASTM A126-B cast iron.

2. Seats: ASTM B21-CA482 or ASTM B301-CA145 bronze.

3. Resilient Seat: AWWA C508.

4. Hinge Arms: ASTM B584-CA865 high tensile bronze.

5. Hinge pins: ASTM B98-CA655 silicon bronze.

PART III: EXECUTION

3.1 PREPARATION

A. Conform to applicable installation Technical Specifications for types of pipe used.

B. Employ workmen who are skilled and experienced in laying pipe of type and joint configuration being furnished. Provide watertight pipe and pipe joints.

C. Lay pipe to lines and grades shown on the Drawings.

D. Confirm that nine feet (9 Ft) minimum separation from gravity sanitary sewers and manholes or separation of four feet (4 Ft) minimum from force mains as specified in this Section in all directions unless a special design is provided on the Drawings.

E. Where above clearances cannot be attained and a special design has not been provided on the Drawings, obtain direction from the Project Manager before proceeding with construction.

F. Inform the Project Manager if unmetered sprinkler or fire line connections exist which are not shown on the Drawings. Make transfer to new lines only after approval by the Project Manager.

G. For projects involving multiple subdivisions or locations, limit water line installation to maximum of two (2) project site locations. Maximizing

two (2) pipe installation crews shall be permitted, unless otherwise approved by the Project Manager.

H. The City of Friendswood Public Works Department shall handle, at no cost to the Contractor, operations involving opening and closing valves for wet connections and for chlorination. The Contractor is responsible for handling necessary installations and removal of chlorination and testing taps and risers.

I. If asbestos-cement (A.C.) pipe is encountered, follow safety practices outlined in American Water Works Association's publication, "Work Practices for A/C Pipe". Strictly adhere to "recommended practices" contained in this publication and make them "mandatory practices" for this Project.

J. For pipe diameters thirty-six inches (36 In) and greater, clearly mark each section of pipe and fitting with unique designation on inside of pipe along with pressure class. Locate unique identifying mark minimum of five feet (5 Ft) away from either end of each section of pipe. Provide one (1) unique identifying mark in middle of each fitting. Place markings at consistent locations. Use permanent black paint and minimum letter height of four inches (4 In) to mark designations.

K. The Contractor is responsible for assuring chosen manufacturer fulfills requirements for extra fittings and, therefore, is responsible for costs due to downtime if requirements are not met by the manufacturer.

L. Do not remove plugs or clamps during months of peak water demands; June, July and August, unless otherwise approved by the Project Manager.

3.2 HANDLING, CLEANING AND INSPECTION

A. Handling:

1. Place pipe along project site where storm water or other water shall not enter or pass through pipe.

2. Load, transport, unload and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars or narrow skids or cradles to come in contact with coatings. Where required, provide pipe fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.

3. Hoist pipe from trench side into trench by means of sling of smooth steel cable, canvas, leather, nylon or similar material.

4. For large diameter water lines, handle pipe only by means of sling of canvas, leather, nylon or similar material. Sling shall be minimum thirty-six inches (36 In) in width. Do not tear or wrinkle tape layers.

5. Use precautions to prevent injury to pipe, protective linings and coatings.

   a. Package stacked pipe on timbers. Place protective pads under banding straps at time of packaging.

   b. Pad fork trucks with carpet or other suitable material. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.

   c. Do not lift pipe using hooks at each end of pipe.

   d. Do not place debris, tools, clothing or other materials in pipe.

   e. Do not drop pipe into trench deeper than two feet (2 Ft). Any pipe that has been dropped shall be marked with an X and shall not be used.

6. Repair damage to pipe or protective lining and coating before final acceptance.

7. For cement mortar line and coated steel pipe and PCCP, permit no visible cracks longer than six inches (6 In), measured within fifteen degrees (15°) of line parallel to pipe longitudinal axis of finished pipe, except:

   a. In surface laitance of centrifugally cast concrete.

   b. In sections of pipe with steel reinforcing collars or wrappers.

   c. Within twelve inches (12 In) of pipe ends.

8. Reject pipe with visible cracks (not meeting exceptions) and remove from project site.

B. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation and keep interior clean until the Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove any debris.

C. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

3.3 EARTHWORK

A. Conform to applicable provisions of Section 02125 Excavation and Backfilling for Utilities and Section 02270 Augering for Water Pipe and Conduit.

B. Bedding: Use bedding materials in conformance with Section 02140 Utility Backfill Materials.

C. Backfill: Use bank run sand or earth or native soil as specified in Section 02140 Utility Backfill Materials. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

D. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density. Water tamping or jetting is not allowed.

E. Pipe Embedment: Including six (6) inch pipe bedding and backfill to twelve inches (12 In) above top of pipe.

3.4 PIPE CUTTING

A. Cut pipe twelve inches (12 In) and smaller with standard wheel pipe cutters. Cut pipe larger than twelve inches (12 In) in manner approved by the Project Manager. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.5 PIPING INSTALLATION

A. General Requirements:

1. Lay pipe in subgrade free of water.

2. Make adjustments of pipe to line and grade by scraping away subgrade or filling in with granular material.

3. Properly form bedding to fully support bell without wedging or blocking up bell.

4. Open Cut Construction: Keep pipe trenches free of water which might impair pipe laying operations. Grade pipe to provide uniform support along bottom of pipe. Excavate for bell holes after bottom has been graded and in advance of placing pipe. Lay not more than nominal city block length of not more than three hundred feet (300 Ft) of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

B. Install pipe continuously and uninterrupted along each street on which the Work is to be performed. Obtain approval of the Project Manager prior to skipping any portion of the Work.

C. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

D. Perform Critical Location as shown on the Drawings. Refer to Section 02125 – Excavation and Backfill for Utilities for additional requirements at critical locations.

E. Laying Large Diameter Water Line:

1. Lay not more than fifty feet (50 Ft) of pipe in trench ahead of backfilling operations.

2. Dig trench to proper width as shown on the Drawings. When trench width below top of pipe becomes four feet (4 Ft) wider than specified, install higher class of pipe or improved bedding, as determined by the Project Manager. No additional payment shall be made for higher class of pipe or improved bedding.

3. Use adequate surveying methods and equipment; employ personnel competent in use of this equipment. Horizontal and vertical deviations from alignment as indicated on the Drawings shall not exceed one-tenth foot (0.10 Ft). Measure and record

"as-built" horizontal alignment and vertical grade at maximum of every one hundred feet (100 Ft) on record drawings.

4. Prevent damage to coating when placing backfill. Use backfill material free of large rocks or stones or other material which could damage coatings.

5. Before assembling couplings, lightly coat pipe ends and outside of gaskets with cup grease or liquid vegetable soap to facilitate installation.

6. Prior to proceeding with critical tie-ins submit sequence of work based on findings from "critical location" effort.

F. Perform following additional procedures when working on plant sites.

1. Seventy-two hours (72 Hrs) prior to each plant shut down or connection, schedule coordination meeting with the Project Manager and Water Production personnel. At this meeting, present proposed sequencing of the Work and verification of readiness to complete the Work as required and within time permitted. Do not proceed with the Work until the Project Manager agrees key personnel, equipment and materials are on hand to complete the Work.

2. Prior to fully excavating around existing piping, excavate as minimal as possible to confirm type and condition of existing joints. Verify size, type and condition of pipe prior to ordering materials or fully mobilizing for the Work.

3. Do not proceed with connections to existing piping and identified critical stages of work unless approved by the Project Manager and the City's Utilities Superintendent is present to observe.

4. Coordinate with the City's Utilities Superintendent to obtain reduction in operating pressures prior to performing connections to existing piping.

5. Make connections to existing piping only when two (2) valves are closed off between connection and source of water pressure. Do not make connection relying solely on one (1) valve being closed, unless otherwise approved by the Project Manager.

6. Perform critical stages of the Work identified on the Drawings at

night or during low water demand months as specified in Section 01110 Summary of Work.

7. Excavation equipment used on plant sites to have smooth bucket; no teeth or side cutters.

8. Submit to the Project Manager One Call Notification transmittal number prior to beginning excavation.

9. Before each "dig" with mechanical excavator, probe ground to determine potential obstructions. Repeat procedure until existing pipe is located or excavation reaches desired elevation. Perform excavations within one foot (1 Ft) of existing piping by hand methods.

10. Provide adequate notice to pipe manufacture s representative when connecting or modifying existing Prestressed Concrete Cylinder Pipe (PCCP).

11. Provide field surveyed (horizontal and vertical elevations) "as-builts" of new construction and existing underground utilities encountered. Submit in accordance with Section 01330 Submittal Procedures.

12. Prior to performing plant work to be done on weekend, provide list of sites and contact person with phone numbers to the Project Manager by noon on each Thursday of week when such work is contemplated. Contact person must be accessible during weekend, have local Metro Area phone number and be authorized to make emergency decisions.

13. No night work or plant shut down shall be scheduled to begin two (2) working days before or after designated City holidays.

G. For tie-ins to existing water lines, provide necessary material on hand to facilitate connection prior to shutting down existing water line. Provide the City a minimum of seventy-two hours (72 Hrs) notice prior to shutting down existing water line.

1. Any work that has not been scheduled seventy-two hours (72 Hrs) before work is to commence, with the exception of emergency operations, shall not be allowed to start.

3.6 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints for Prestressed Concrete

Cylinder Pipe (PCCP), Bar Wrapped Pipe PVC, Steel and DIP:

1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.

2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.

3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.

4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.

5. Where preventing movement of sixteen inch (16 In) diameter or greater pipe is necessary due to thrust, use restrained joints as shown on the Drawings.

   a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.

   b. Do not include passive resistance of soil in thrust restraint calculations.

6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell as shown on the Drawings. Means may consist of wedges or other types of stops as approved by the Project Manager.

B. Flanged Joints where required on Prestressed Concrete Cylinder Pipe (PCCP), Bar Wrapped Pipe, Ductile Iron Pipe (DIP) or Steel Pipe:

1. AWWA C207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle vertical, horizontal or north-south center line. Do not exceed three sixty-fourths inch per foot (3/64 In/Ft) inclination of flange face from true alignment.

2. Use full-face gaskets for flanged joints. Provide one-eighth inch (1/8 In) thick cloth inserted rubber gasket material. Cut

gaskets at factory to proper dimensions.

3. Use galvanized or black nuts and bolts to match flange material. Use cadmium plated steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two (2) flanges at points around flanges. Tighten bolts alternately one hundred eighty degrees (180°) apart until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Densco petroleum based tape or approved equal for all exposed portions of nuts, bolts and pipe.

4. Full length bolt isolating sleeves and washers shall be used with flanged connections.

5. For in-line flange joints thirty inches (30 In) in diameter and greater and at butterfly valve flanges, provide Pyrox G-10 with nitrite seal, conforming to ANSI A 21.11 mechanical joint gaskets. For in-line flange joints sized between twelve inches (12 In) in diameter and greater and twenty-four inches (24 In) in diameter and smaller, provide Phenolic PSI with nitrite seal gasket conforming to ANSI A 21.11 mechanical joint gaskets.

C. Welded Joints (Prestressed Concrete Cylinder Pipe (PCCP), Bar Wrapped Pipe, Steel Pipe):

1. Prior to starting work, provide certification of qualification for welders employed on project for type of work procedures and positions involved.

2. Joints: AWWA C206. Full-fillet, single lap-welded slip-type either inside or outside or double butt-welded type; use automatic or hand welders; completely penetrate deposited metal with base metal; use filler metal compatible with base metal; keep inside of fittings and joints free from globules of weld metal which would restrict flow or become loose. Do not use mitered joints. For interior welded joints, complete backfilling before welding. For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for thirty inch (30 In) and smaller.

3. Furnish welded joints with trimmed spigots and interior welds for thirty-six inch (36 In) and larger pipe.

4. Bell-and-spigot, lap-welded slip joints: Deflection may be taken at joint by pulling joint up to three-quarters inch (3/4 In) as long

as one and one-half inch (1-1/2 In) minimum lap is maintained. Spigot end may be miter cut to take deflections up to five degrees (5°) as long as joint tolerances are maintained. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to five degrees (5°).

5. Align piping and equipment so that no part is offset more than one-eighth inch (1/8 In). Set fittings and joints square and true and preserve alignment during welding operation. For butt welded joints, align abutting ends to minimize offset between surfaces. For pipe of same nominal wall thickness, do not exceed one-sixteenth inch (1/16 In) offset. Use line-up clamps for this purpose; however, take care to avoid damage to linings and coatings.

6. Protect coal-tar-epoxy lining during welding by draping an eighteen inch (18 In) wide strip of heat resistant material over top half of pipe on each side of lining holdback to avoid damage to lining by hot splatter. Protect tape coating similarly if external welding is required.

7. Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.

8. Deposit metal in successive layers to provide at least two (2) passes or beads for automatic welding and three (3) passes or beads for manual welding in completed weld.

9. Deposit no more than one-quarter inch (1/4 In) of metal on each pass. Thoroughly clean each individual pass with wire brush or hammer to remove dirt, slag or flux.

10. Do not weld under weather condition that would impair strength of weld, such as wet surface, rain or snow, dust or high winds, unless work is properly protected.

11. Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.

12. Remove dirt, scale and other foreign matter from inside piping before tying in sections, fittings or valves.

13. Welded Joints for Large Diameter Water Lines:

    a. Furnish pipe with trimmed spigots and interior welds for

thirty-six inch (36 In) and larger pipe.

b. Use exterior welds for thirty inch (30 In) and smaller.

c. Only one (1) end may be miter cut. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to two and one-half degrees (2-1/2°).

d. For large diameter water lines, employ an independent certified testing laboratory, approved by the Project Manager, to perform weld acceptance tests on welded joints. Include cost of such testing and associated work to accommodate testing in contract unit price bid for water line. Furnish copies of test reports to the Project Manager for review. The Project Manager has the final decision as to suitability of welds tested.

1) Weld acceptance criteria:

a) Conduct in accordance with ASTM E165-Standard Test Method for Liquid Penetrant Examination and ASTM E709 Standard Guide for Magnetic Particle Examination. Use X-ray methods for butt welds, for one hundred percent (100%) of joint welds.

b) Examine welded surfaces for the following defects:

i) Cracking.

ii) Lack of fusion/penetration.

iii) Slag which exceeds one-third (1/3) of (t) where (t) equals material thickness.

iv) Porosity/Relevant rounded indications greater than three-sixteenths inch (3/16 In); rounded indication is one (1) of circular or elliptical shape with length equal to or less than three (3) times its width.

v) Relevant linear indications in which length of linear indication exceeds

three (3) times its width.

vi) Four (4) or more relevant one-sixteenth inch (1/16 In) rounded indications in line separated by one-sixteenth inch (1/16 In) or less edge to edge.

14. After pipe is joined and prior to start of welding procedure, make spigot and bell essentially concentric by jacking, shimming or tacking to obtain clearance tolerance around periphery of joint except for deflected joints.

15. Furnish each welder employed steel stencil for marking welds, so work of each welder can be identified. Mark pipe with assigned stencil adjacent to weld. When welder leaves job, stencil must be voided and not duplicated. Welder making defective welds must discontinue work and leave project site. Welder may return to project site only after recertification.

16. Provide cylindrical corrosion barriers for epoxy lined steel pipe twenty-four inch (24 In) diameter and smaller, unless minimum wall thickness is one-half inch (1/2 In) or greater.

    a. In addition to welding requirements contained here in Paragraph 3.6, conform to protection fitting manufacturer's installation recommendations.

    b. Provide services of technical representative of manufacturer available on site at beginning of pipe laying operations. Representative to train welders and advise regarding installation and general construction methods. Welders must have twelve months (12 Mos) prior experience installing protection fittings.

    c. All steel pipe is to have cutback three-quarters inch (3/4 In) to not greater than one inch (1 In) of internal diameter coating from weld bevel.

    d. Furnish steel fittings with cylindrical corrosion barriers with shop welded extensions to end of fittings. Extension length to measure no less than diameter of pipe. Shop apply lining in accordance with AWWA C210 or AWWA C213.

    e. All steel pipe receiving field adjustments are to be cold

cut using standard practices and equipment. No cutting using torch is to be allowed.

D. Harnessed Joints (Prestressed Concrete Cylinder Pipe (PCCP), Bar Wrapped Pipe):

1. Use of snap-ring type restrained joints on pipe is limited to twenty inch (20 In) through forty-eight inch (48 In) diameters.

2. Position snap-ring joint bolt on top [twelve (12) o'clock position]. Provide minimum one-half inch (1/2 In) joint recess. Use joint "diapers" minimum of twelve inches (12 In) wide.

3. For field adjustments with deflections beyond manufacturer's recommendations:

   a. Field trim spigot.

   b. Do not engage ring.

4. Harnessed joints shall not be permitted in areas defined on the Drawings as potentially petroleum contaminated material, in tunnels or at bend greater than five degrees (5°).

5. Install harness type joints including snap rings at straight sections of pipe.

E. Restrained Joints

1. For existing water lines and water lines less than sixteen inches (16 In) in diameter, restrain pipe joints with concrete thrust blocks.

2. Thrust restraint lengths shown on the Drawings are minimum anticipated lengths. These lengths are based on deflections indicated and on use of Prestressed Concrete Cylinder Pipe (PCCP) for large diameter lines and ductile Iron Pipe (DIP) for small diameter lines. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a Professional Engineer licensed by the State of Texas for review by the Project Manager. Make adjustments in thrust restraint lengths at no additional cost to the City.

3. Passive resistance of soil shall not be permitted in calculation of thrust restraint.

4. For sixteen inch (16 In) lines and larger use minimum sixteen foot (16 Ft) length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on the Drawings. Otherwise, provide restraint joints for a minimum length of sixteen feet (16 Ft) on each side of beveled joints.

5. Restraint Devices:

   a. Prestressed Concrete Cylinder Pipe (PCCP), bar wrapped pipe and steel pipe, that has either welded or flanged fittings or valves, shall not need to be further restrained.

   b. Mega-lug fittings are the acceptable and preferred method of restraint for all other piping with the exception of those listed in paragraph 3.7.E.5.d of this Section.

   c. Use of Ellison clamps and all-threaded rod is allowed with the approval of the Project Manager. Ellison clamps, all-threaded rod and other hardware shall be 316 stainless steel. Ellison clamp shall be a minimum of two feet (2 Ft) from edge of fitting.

   d. All offsets, even if Mega-lugs are used on the fittings, shall have Ellison clamps on the end and/or sides of the offset and shall have stainless steel all-threaded rod connections in between fittings to prevent movement.

5. Installation:

   a. Install restrained joints mechanism in accordance with manufacturer's recommendations.

   b. Examine and clean mechanism; remove dirt, debris and other foreign material.

   c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.

   d. Verify gasket is evenly seated.

e. Do not over stab pipe into mechanism.

6. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.

7. Place Class C, two thousand five hundred pounds per square inch (2500 psi) concrete conforming to Section 03300 Structural Concrete, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, four days (4 D) prior to hydrostatic testing of pipeline. Test may be made two days (2 D) after completion of blocking if Type II cement is used.

F. Joint Grout (Prestressed Concrete Cylinder Pipe (PCCP), Bar Wrapped Pipe, Steel Pipe):

1. Mix cement grout mixture by machine except when less than one-half cubic yard (1/2 Cy) is required. When less than one-half cubic yard (1/2 Cy) is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Place grout within twenty minutes (20 Min) after mixing. Discard grout that has set. Retempering of grout by any means is not permitted.

2. Prepare grout in small batches to prevent stiffening before it is used. Do not use grout which has become so stiff that proper placement cannot be assured without retempering. Use grout for filling grooves of such consistency that it shall adhere to ends of pipe.

3. Surface Preparation: Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces with wire brush or hammer to sound, clean surface. Remove rust and foreign materials from metal surfaces in contact with grout.

4. Follow established procedures for hot and cold weather concrete placement.

5. Complete joint grout operations and backfilling of pipe trenches as closely as practical to pipe laying operations. Allow grouted exterior joints to cure at least one hour (1 Hr) before compacting backfill.

6. Grouting exterior joint space: Hold wrapper in place on both sides of joint with minimum five-eighths inch (5/8 In) wide steel

straps or bands. Place no additional bedding or backfill material on either side of pipe until after grout band is filled and grout has mechanically stiffened. Pull ends of wrapper together at top of pipe to form access hole. Pour grout down one side of pipe until it rises on other side. Rod or puddle grout to ensure complete filling of joint recess. Agitate for fifteen minutes (15 Min) to allow excess water to seep through joint band. When necessary, add more grout to fill joint completely. Protect gap at top of joint band from backfill by allowing grout to stiffen or by covering with structurally protective material. Do not remove band from joint. Proceed with placement of additional bedding and backfill material.

7. Interior Joints for Pipe twenty-four inches (24 In) and smaller: Circumferentially butter bell with grout prior to insertion of spigot, strike off flush surplus grout inside pipe by pulling filled burlap bag or inflated ball through pipe with rope. After joint is engaged, finish off joint grout smooth and clean. Use swab approved by the Project Manager for twenty inch (20 In) pipe and smaller.

8. Protect exposed interior surfaces of steel joint bands by metallizing, by other approved coatings or by pointing with grout. Joint pointing may be omitted on potable water pipelines if joint bands are protected by zinc metallizing or other approved protective coatings.

9. Remove and replace improperly cured or otherwise defective grout.

10. Strike off grout on interior joints and make smooth with inside diameter of pipe.

11. When installed in tunnel or encasement pipe and clearance within casing does not permit outside grout to be placed in normal manner, apply approved flexible sealer, such as Flex Protex or equal, to outside joint prior to joint engagement. Clean and prime surfaces receiving sealer in accordance with manufacturer's recommendations. Apply sufficient quantities of sealer to assure complete protection of steel in joint area. Fill interior of joint with grout in normal manner after joint closure.

12. Interior Joints for Water Lines thirty inches (30 In) and larger: Clean joint space, wet joint surfaces, fill with stiff grout and trowel smooth and flush with inside surfaces of pipe using steel trowel so that surface is smooth. Accomplish grouting at end of

each work day. Obtain written acceptance from the Project Manager of inside joints before proceeding with next day's pipe laying operation. During inspection, insure no delamination of joint mortar has occurred by striking joint mortar lining with rubber mallet. Remove and replace delaminated mortar lining.

13. Work which requires heavy equipment to be over water line must be completed before mortar is applied to interior joints.

G. Large Diameter Water Main Joint Testing: In addition to testing individual joints with feeler gauge approximately one-half inch (1/2 In) wide and fifteen thousandths inch (0.015 In) thick, use other joint testing procedure approved or recommended by pipe manufacturer which shall help ensure watertight installation prior to backfilling. Perform tests at no additional cost to the City.

H. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by the Project Manager. Submit details of other methods of providing curves and bends which exceed manufacturer's recommended deflection prior to installation.

1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on the Drawings.

2. If deflection exceeds that specified but is less than five percent (5%), repair entire deflected pipe section such that maximum deflection allowed is not exceeded.

3. If deflection is equal to or exceeds five percent (5%) from that specified, remove entire portion of deflected pipe section and install new pipe.

4. Replace, repair or reapply coatings and linings as required.

5. Assessment of deflection may be measured by the Project Manager at location along pipe. Arithmetical averages of deflection or similar average measurement methods shall not be deemed as meeting the intent of this standard.

6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

I. Closures Sections and Approved Field Modifications to Steel, Prestressed Concrete Cylinder Pipe (PCCP), Bar Wrapped Pipe and Fittings:

1. Apply welded-wire fabric reinforcement to interior and exterior of exposed interior and exterior surfaces greater than six inches (6 In) in diameter. Welded-wire fabric: minimum W1; maximum spacing two inches by four inches (2 In x 4 In); three-eighths inch (3/8 In) from surface of steel plate or middle third (3rd) of lining or coating thickness for mortar thickness less than three-quarters inch (3/4 In).

2. Fill exposed interior and exterior surfaces with nonshrink grout.

3. For pipe diameters thirty-six inches (36 In) and greater, perform field welds on interior and exterior of pipe.

4. For large diameter water lines, provide minimum overlap of four inches (4 In) of butt strap over adjacent piece on butt-strap closures.

3.7 CATHODIC PROTECTION APPURTENANCES

A. Conform to requirements of Section 02285 Cathodic Protection.

B. Where identified on the Drawings, modify pipe for cathodic protection as detailed on the Drawings and specified. Unless otherwise noted, provide insulation kits including test stations at connections to existing water system or at locations to isolate one (1) type of cathodic system from another type, between water line, access manhole piping and other major openings in water line or as shown on the Drawings.

C. Bond joints for pipe installed in tunnel or open cut, except where insulating flanges are provided. Weld strap or clip between bell and spigot of each joint or as shown on the Drawings. No additional bonding required where joints are welded for thrust restraint. Repair coatings as specified by appropriate AWWA standard, as recommended by manufacturer and as approved by the Project Manager.

D. Bonding Strap or Clip: Free of foreign material that may increase contact resistance between wire and strap or clip.

3.8 SECURING, SUPPORTING AND ANCHORING

A. Support piping as shown on the Drawings and as specified in this Section, to maintain line and grade and prevent transfer of stress to adjacent structures.

B. Where shown on the Drawings, anchor pipe fittings and bends installed on water line by welding consecutive joints of pipe together to distance each side of fitting. Restrained length, as shown on the Drawings, assumes that installation of pipe and subsequent hydrostatic testing begins upstream and proceed downstream, with respect to normal flow of water in pipe. If installation and testing differs from this assumption, submit for approval revised method of restraining pipe joints upstream and downstream of device used to test against (block valve, blind flange or dished head plug).

C. Use adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Use sufficient anchorage and blocking to resist stresses and forces encountered while tapping existing water line.

3.9 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE (DIP)

A. Double wrap pipe and appurtenances (except fire hydrants and fusion bond or polyurethane coated fittings) with eight (8) mil polyethylene film.

B. Do not use polyethylene wrap if pipe is cathodically protected.

C. Conform to requirements of Section 02260 Polyethylene Wrap.

3.10 CLEANUP AND RESTORATION

A. Provide cleanup and restoration crews to work closely behind pipe laying crews and where necessary, during disinfection and hydrostatic testing, service transfers, abandonment of old water lines, backfill and surface restoration.

B. Unless otherwise approved by the Project Manager, comply with the following;

1. Once water line is installed to limits approved in layout submitted, immediately begin preparatory work for disinfection effort.

2. Immediately after transfer of services, begin abandonment of old water lines and site restoration.

3. Do not exceed a total of fifty percent (50%) of total project linear feet of disturbed right-of-way and easement until site is restored in accordance with Section 01745 Site Restoration.

4. Exceeding any of the above footage limitations shall be

considered a material breach of the Contract and subject to termination in accordance with the General Conditions.

C. For large diameter water lines, do not install more than two thousand linear feet (2000 Lf) of water line, without previous two thousand linear feet (2000 Lf) being restored in accordance with Section 01745 Site Restoration. Schedule paving crews so repaving work shall not lag behind pipe laying work by more than one thousand linear feet (1000 Lf). Failure to comply with this requirement shall be considered a material breach of the Contract and subject to termination in accordance with the General Conditions.

3.11 CLEANING PIPING SYSTEMS

A. Remove construction debris or foreign material and thoroughly broom clean and flush piping systems. Provide temporary connections, equipment and labor for cleaning. The City must inspect water line for cleanliness prior to filling.

3.12 DISINFECTION OF WATER LINES

A. Conform to requirements of Section 02455 Disinfection of Waterlines.

1. No later than three days (3 D) after completing disinfection preparatory work, submit to the City appropriate request for disinfection.

2. Schedule City' Utilities Superintendent at least seventy-two hours (72 Hrs) before disinfection or blowing off of lines. The City Water personnel shall turn all valves on and off for the duration.

3. Water Lines shall not be placed into service until all Bac-T testing has passed.

3.13 FIELD HYDROSTATIC TESTS

A. Conform to requirements of Section 02450 Hydrostatic Testing of Waterlines.

END OF SECTION

SECTION 02405

BUTTERFLY VALVES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Butterfly valves.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for butterfly valves twenty inches (20 In) in diameter and smaller shall be on the unit price basis for each.

2. Payment for butterfly valves twenty-four inches (24 In) in diameter and greater is on a unit price basis.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASME American Society of Mechanical Engineers.

1. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM American Society for Testing and Materials.

1. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

C. AWWA American Water Works Association.

1. AWWA C504 Standard for Rubber-Seated Butterfly Valves.

2. AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants.

D. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 02125 Excavation and Backfill for Utilities.
4. Section 02305 Precast Concrete Manholes.
5. Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.
6. Section 02450 Hydrostatic Testing of Waterlines.
7. Section 02455 Disinfection of Waterlines.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturer s product data for proposed valves and actuators for approval.

C. Submit manufacturer s affidavit for proposed valves and actuators certifying compliance with the Technical Specifications.

D. Submit manufacturer s affidavit that butterfly valves were manufactured in the United States and conform to applicable requirements of AWWA C504 and that they have been satisfactorily tested in the United States in accordance with AWWA C504 using test pressure of one hundred fifty pounds per square inch (one hundred fifty pounds per square inch (150 psi)) in both directions. Submit Proof-of-Design and hydrostatic testing procedure in accordance with AWWA C504.

E. Submit manufacturer s affidavit that coating for interior surfaces of valves conform to applicable requirements of AWWA C550. Submit results of holiday test and thickness measurements of coatings.

F. Furnish, at time of delivery, affidavit of compliance, as specified in Section 6.3 of AWWA C504 certifying compliance with applicable portion of AWWA C504 and modification or supplements herein. Furnish certified drawings and material test records by manufacturer covering items included in Section 4.3 of AWWA C504, for review. Furnish certified copies of test reports covering items in Sections 4.5.8.5.5, 4.5.8.5.8 and 5.2.1 through 5.2.4.3 of AWWA C504 for

review.

G. Submit data indicating maximum torque required to open valve, maximum torsional strength of shaft and torque output of actuator.

H. Provide submittal information on CD-ROM in Adobe portable document format (*.PDF).

I. Include number of turns to operate valves to fully open/closed.

1.5 QUALITY CONTROL

A. Perform valve leakage tests in both directions at one hundred fifty pounds per square inch (150 psi) in factory and field. Hydrostatic field tests of one hundred fifty pounds per square inch (150 psi) shall be made against dished head plug or similar arrangement.

B. For purposes of interpreting referenced AWWA tests, the following shall apply: Shutoff pressure is one hundred fifty pounds per square inch (150 psi); cycle consists of rotating disc from fully opened to fully closed position, for valves larger than seventy-two inches (72 In), proof of design shall require one thousand (1000) cycles and shall be performed on valve greater than seventy-two inches (72 In) of like design and construction. When proof of design tests are performed on valve delivered to job site, replace disc, bushing, shaft and seals with new and unused items and test and certify as described above.

C. Hydrostatic Testing by Manufacturer:

1. Hydrostatic testing to be witnessed by the Project Manager prior to shipment of valves. Provide minimum four weeks (4 Wks) notice to the Project Manager to schedule witness testing. When possible, maximize number of valves to be tested during a plant visit, no more than two (2) visits shall be allowed per project to witness test valves, unless otherwise approved by the Project Manager. The City shall pay expenses for each visit up to total of two (2) visits incurred by the Project Manager to witness testing of each grouping of valve(s) per project. Expenses for subsequent or extended visits by the Project Manager for defective valves, improper scheduling or valve failures are to be paid by the Contractor. Witness of hydrostatic testing by the Project Manager shall only be in regards to compliance with this Technical Specification and shall not constitute approval by the Project Manager nor relieve the Contractor of obligations to comply with the Contract Documents.

2. Document serial number on valve at time of testing and reflect in certified test records furnished to the Project Manager. Identification plate shall be permanently affixed to valve and actuator prior to hydrostatic testing.

3. Hydrostatic testing to conform to AWWA C504 except as modified below:

   a. Install actuator prior to hydrostatic testing. Test actuator to verify actual number of turns match manufacturer's published number of turns. Verify valve stops are in correct positions.

   b. Fully open and close valve prior to performing shell test and prior to each leakage test.

   c. Perform shell test first (1st).

   d. When tested with water, adequately dry seat and disc.

   e. When tested with air, fill top of valve with water to aid in viewing possible leakage.

   f. Pressure Gauges: Calibrated within past twelve months (12 Mos); zero pounds per square inch (0 psi) to five hundred pounds per square inch (500 psi) range in increments of five pounds per square inch (5 psi), present calibration certificates prior to hydrostatic testing.

   g. If seat adjustment is required during hydrostatic testing, perform valve leakage test again in both directions. Once seat adjustment is made, fully open and fully close valve three (3) times and repeat leakage test.

4. Field Testing

   a. When valve arrives at the job site, the Contractor shall operate valve fully open and closed twice in presence of the Project Manager. Document number of turns to open and close each time.

   b. Install operator nut plum.

   c. After valve is installed, repeat the operation test and

document number of turns in presence of the Project Manager.

d. Manufacturer's representative must be present to witness the operation test again at the substantial completion walk-through. Verify valve operate fully open/closed twice at the appropriate number of turns.

PART II: PRODUCTS

2.1 VALVES AND ACTUATORS

A. Butterfly Valves and Actuators: Provide approved butterfly valves and actuators. Conform to AWWA C504, except as modified or supplemented herein.

B. If type of valve is not indicated on the Drawings, use butterfly valves for line valve sizes twenty-four inch (24 In) and larger. When type of valve is specified on the Drawings, no substitute shall be allowed, unless otherwise approved by the Project Manager.

C. Butterfly valves shall be short-body, flanged design and installed at locations as shown on the Drawings.

D. Direct-bury valves and valves in subsurface vaults shall open left (counterclockwise). Above-ground and plant valves shall open left (counterclockwise).

E. Provide flanged joints when valve is connected to steel or PCCP.

F. Butterfly Valves and Actuators (Additional Requirements for Large Diameter Water Lines):

1. Provide valves from approved manufacturer. Provide all valves for single project, from same manufacturer.

2. Valves larger than seventy-two inches (72 In) in diameter design: allowable stresses at rated pressure not to exceed one-third (1/3) of yield strength or one-fifth (1/5) of ultimate strength of material used.

3. Provide manual actuators for single project from same manufacturer.

4. Shaft connecting actuator to valve body must be fully enclosed. Valve bonnet and shaft extension to be fully enclosed and

watertight.

2.2 VALVE CONSTRUCTION

A. Valves: AWWA C504, Class 150B. Body: Cast iron, ASTM A126, Class B. Flanges: ASME B16.1, Class 125 lb.

B. Discs for Butterfly Valves: Either cast iron or ductile iron. Valves greater than fifty-four inches (54 In) in diameter must utilize flow through disc.

C. Seats: Buna-N or neoprene and may be applied to disc or body. Seats shall be mechanically secured and shall not rely solely on adhesive properties of epoxy or similar bonding agent to attach seat to body. Seats on disc shall be mechanically retained by stainless steel (18-8) retaining ring held in place by stainless steel (18-8) cap screws that pass through rubber seat for added retention. When seat is on disc, seat shall be retained in position by shoulders located on both disc and stainless-steel retaining ring. Mating surfaces for seats: Type 304 or 316, stainless steel and secured to disc by mechanical means. Sprayed-on or plated mating surfaces shall not be allowed. Seat shall be replaceable in field for valves greater than thirty inches (30 In) in diameter. Valves with segmented retaining rings shall not be accepted.

D. Coat interior wetted ferrous surfaces of valve, including disc, with epoxy suitable for potable water conditions. Epoxy, surface preparation and epoxy application in accordance with AWWA C550 and coating manufacturer's recommendations. Provide three (3) coats of two (2) component, high-build epoxy with minimum dry film thickness of twelve (12) mils. Provide approved epoxy coating. Coatings shall be holiday-tested and measured for thickness.

E. Valve shaft and keys: twenty-four inches (24 In) in diameter and greater valves require a minimum of two (2) taper pins used for attaching valve shaft to valve disc, use of torque plug for purposes of attaching valve shaft to valve disc is not permitted: Type 316 stainless steel. Shaft Bearings: Stainless steel, bronze, nylon or Teflon (supported by fiberglass mat or backing material with proven record of preventing Teflon flow under load) in accordance with AWWA C504. Sinter stainless steel bearing material. Design valve shaft to withstand three (3) times amount of torque necessary to open valve.

F. Packing: Self adjusting and wear compensating, full or split ring V-type and replaceable without removing actuator assembly.

G. Retaining Hardware for Seats: Type 304 or 316 stainless steel. Nuts

and screws used with clamps and discs for rubber seats shall be held securely with locktight, or other approved method, to prevent loosening by vibration or cavitational effects.

H. Valve disc shall seat in position at ninety degrees (90°) to pipe axis and shall rotate ninety degrees (90°) between full-open and tight-closed position. Install valves with valve shafts horizontal and convex side of disc facing anticipated direction of flow, except where shown otherwise on the Drawings.

I. For valves utilizing retaining rings, tighten bolts to a uniform torque. Measure torque prior to testing valve.

2.3 VALVE ACTUATOR CONSTRUCTION

A. Provide actuators for valves with size based on line velocity of twelve feet per second (12 Ft/Sec) and unidirectional service and, unless otherwise shown on the Drawings, equip with geared manual actuators. Provide fully enclosed and traveling-nut type, rack-and-pinion type or worm-gear type for valves twenty inches (20 In) and smaller. Provide worm-gear type for valves twenty-four inches (24 In) and larger.

B. Provide actuator designed for installation with valve shaft horizontal unless otherwise indicated on the Drawings.

C. Provide bonnet extensions, as required, between valve body and actuator. Space between actuator housing and valve body shall be completely enclosed so that no moving parts are exposed to soil or elements.

D. Provide oil-tight and watertight actuator housings for valves, specifically designed for buried service or submerged service when located in valve vaults and factory packed with suitable grease.

E. Install valve position indicator on each actuator housing located above ground or in valve vaults. Valves shall be equipped with two inch (2 In) actuator nut only.

F. Indicate direction of opening of valve on exposed visible part of assembly and cast direction of open on two inch (2 In) nut on top of valve operator extension. Paint two inch (2 In) actuator nut and extension shaft black when counter-clockwise open.

G. Design worm-gear or traveling-nut actuators to be self-locking and designed to transmit twice the required actuator torque without damage to faces of gear teeth or contact faces of screw or nut.

2.4 VALVE BOXES

A. Provide Standard Type "A" valve boxes conforming to requirements of Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

2.5 VALVE SERVICE MANHOLES

A. For large diameter water lines, provide manholes to dimensions shown on the Drawings conforming to requirements of Section 02305 Precast Concrete Manholes.

PART III: EXECUTION

3.1 EARTHWORK

A. Conform to applicable provisions of Section 02125 Excavation and Backfill for Utilities.

3.2 SETTING VALVES AND VALVE BOXES

A. Prior to Hydrostatic testing of water line and valve:

1. Test valve by opening and closing valve at a minimum of two (2) times to verify valve seats properly.

2. Verify number of turns from fully open to fully closed position is same as identified in manufacturer s submittal.

3. Adjust valve as required if number of turns do not match.

4. Remove foreign matter from within valves.

B. Install valves where shown on the Drawings or as located by the Project Manager. Use valve boxes for sixteen inch (16 In) and twenty-four inch (24 In) valves. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of four feet (4 Ft) or to undisturbed trench face when less than four feet (4 Ft).

C. Avoid disturbing or overstressing valve body when installing valves. Perform field adjustment of valves under pressure to ensure shutoff occurs in number of rotations as described in valves operation and maintenance manual.

D. Attach two (2) four feet (4 Ft) lengths of pipe to each side of valve

prior to installation in line.

E. Submit certification that large diameter valve was installed, adjusted and exercised in accordance with manufacturer's instructions. Manufacturer's certification shall state that all performance characteristics of large diameter valves, as installed, have been met. Adjustments made to valve, for any reason, must be made by manufacturer's representative.

3.3 DISINFECTION AND TESTING

A. The Contractor shall disinfect valves and appurtenances as required by Section 02455 – Disinfection of Waterlines and test as required by Section 02450 – Hydrostatic Testing of Waterlines. Do not use valves for throttling without prior approval of manufacturer.

3.4 COATING OF PIPING

A. Coat valves located in vaults, stations and above ground using approved paint. Minimum of two (2) coats shall be applied with minimum of three (3) mil thickness. Apply coating in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 02410

GATE VALVES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Gate valves.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for gate valves is on a unit price basis. The unit price includes cost of required box for gate valves and extensions.

2. Payment for two inch (2 In) blow-off valve with box is on a unit price basis for each installation.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

2. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Casting.

3. ASTM B763 Standard Specification for Copper Alloy Sand Casting for Valve Application.

4. ASTM D429 Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.

B. AWWA American Water Works Association.

1. AWWA C500 Standard for Metal-Seated Gate Valves for Water Supply Service.

2. AWWA C509 Standard for Resilient-Seated Gate Valves for Water Supply Service.

3. AWWA C515- Standard for Reduced Wall, Resilient- Seated Gate Valves for Water Supply Service.

4. AWWA C550 Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02450 Hydrostatic Testing of Waterlines.

5. Section 02455 Disinfection of Waterlines.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturer s product data for proposed valves for approval.

C. Provide detailed drawings of gearing mechanism for twenty inch (20 In) and larger gate valves.

1.5 QUALITY CONTROL

A. Submit manufacturer s affidavit that gate valves are manufactured in the United States and conform to stated requirements of AWWA C500, AWWA C509, AWWA C515 and this Section and that they have been satisfactorily tested in the United States in accordance with AWWA C500, AWWA C509 and AWWA C515.

PART II: PRODUCTS

2.1 MATERIALS

A. Gate Valves: AWWA C500, AWWA C509, AWWA C515 and additional requirements of this Section. Direct bury valves and those in subsurface vaults shall open counterclockwise (left hand).

B. If type of valve is not indicated on the Drawings, use gate valves as line valves for sizes twenty inches (20 In) and smaller. When type of valve is indicated, no substitute is allowed.

C. Gate Valves one and one-half inches (1-1/2 In) in diameter and smaller: one hundred twenty-five pounds per square inch (125 psi) pressure rating; bronze; rising-stem; singlewedge; disc type; screwed ends

D. Coatings for Gate Valves two inches (2 In) and larger: AWWA C550 non-toxic, imparts no taste to water, functions as physical, chemical and electrical barrier between base metal and surroundings, minimum eight (8) mil-thick, fusion-bonded epoxy. Prior to assembly of valve, apply protective coating to interior and exterior surfaces of body.

E. Gate Valves two inches (2 In) in diameter: Iron body, double disc or resilient-seated, non-rising stem, one hundred fifty pounds per square inch (150 psi) pressure rating, two inch (2 In) square nut operating to open counterclockwise (left hand).

F. Gate Valves three inches (3 In) to twelve inches (12 In) in diameter: Non-directional, standard-wall resilient seated (AWWA C509), parallel seat double disc (AWWA C500) or reduced-wall resilient seated gate valves (AWWA C515), two hundred pounds per square inch (200 psi) pressure rating, bronze mounting, push-on bell ends with rubber joint rings and nut-operated unless otherwise specified. Provide approved standard-wall resilient seated valves. Provide approved reduced-wall resilient seated valves. Provide approved double disc valves. Comply with following requirements unless otherwise specified in the Drawings:

1. Design: Fully encapsulated rubber wedge or rubber seat ring mechanically attached with minimum 304 stainless-steel fasteners or screws; threaded connection isolated from water by compressed rubber around opening.

2. Body: Cast or ductile iron, flange bonnet and stuffing box together with ASTM A307 Grade B bolts. Manufacturer's initials, pressure rating and year manufactured shall be cast in body.

3. Bronze: Valve components in waterway shall contain not more than fifteen percent (15%) zinc and not more than two percent (2%) aluminum.

4. Stems: ASTM B763 bronze, alloy number-995 minimum yield strength of forty thousand pounds per square inch (40,000 psi); minimum elongation in two inches (2 In) of twelve percent (12%), non-rising.

5. O-rings: For AWWA C500, Section 3.12.2. For AWWA C509, Sections 2.2.6 and 4.8.2. For AWWA C515, Section 4.2.2.5.

6. Stem Seals: Consist of three (3) O-rings, two (2) above and one (1) below thrust collar with anti-friction washer located above thrust collar for operating torque.

7. Stem Nut: Independent or integrally cast of ASTM B62 bronze.

8. Resilient Wedge: Molded, synthetic rubber, vulcanized and bonded to cast or ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D429 Method B; seat against epoxy-coated surface in valve body.

9. Bolts: AWWA C500 Section 3.4, AWWA C509 Section 4.4 or AWWA C515 Section 4.4.4; stainless steel; cadmium plated or zinc coated.

G. Gate valves fourteen inch (14 In) and larger in Diameter: AWWA C500; parallel seat double disc gate valves; push-on bell ends with rubber rings and nut-operated unless otherwise specified. Provide approved double disc valves with one hundred fifty pounds per square inch (150 psi) pressure rating. Comply with following requirements unless otherwise specified on the Drawings:

1. Body: Cast iron or ductile iron; flange together bonnet and stuffing box with ASTM A307 Grade B bolts. Cast following into valve body manufacturer's initials, pressure rating and year manufactured. When horizontally mounted, equip valves greater than twelve inches (12 In) in diameter with rollers, tracks and scrapers.

2. O rings: For AWWA C500, Section 3.12.2. For AWWA C515, Section 4.2.2.5.

3. Stems: ASTM B763 bronze, alloy number-995 minimum yield

strength of forty thousand pounds per square inch (40,000 psi); minimum elongation in two inches (2 In) of twelve percent (12%), non-rising.

4. Stem Nut: Machined from ASTM B62 bronze rod with integral forged thrust collar machined to size; non-rising.

5. Stem Seals: Consist of three (3) O-rings, two (2) above and one (1) below thrust collar with antifriction washer located above thrust collar for operating torque.

6. Bolts: AWWA C500 Section 3.4 or AWWA C515 Section 4.4.4; stainless steel; cadmium plated or zinc coated.

7. Discs: Cast iron with bronze disc rings securely penned into machined dovetailed grooves.

8. Wedging Device: Solid bronze or cast-iron, bronze-mounted wedges. Thin plates or shapes integrally cast into cast-iron surfaces are acceptable. Other moving surfaces integral to wedging action shall be bronze monel or nickel alloy-to-iron.

9. Provide bypass for valves sixteen inches (16 In) and larger.

10. Bronze Mounting: Built as integral unit mounted over or supported on, cast-iron base and of sufficient dimensions to be structurally sound and adequate for imposed forces.

11. Gear Cases: Cast iron; furnished on eighteen (18) inch and larger valves and of extended type with steel side plates, lubricated, gear case enclosed with oil seal or O-rings at shaft openings.

12. Stuffing Boxes: Located on top of bonnet and outside gear case.

H. Gate valves fourteen inches (14 In) to twenty-four inches (24 In): Provide AWWA C515; reduced-wall, resilient seated gate valves with 250 psi pressure rating. Furnish with spur or bevel gearing.

1. Mount valves horizontally if proper ground clearance cannot be achieved by normal vertical installation. For horizontally mounted gate valves, provide bevel operation gear mounted vertically for above ground operation.

2. Use valve body, bonnet, wedge and operator nut constructed of

ductile iron. Fully encapsulate exterior of ductile iron wedge with rubber.

3. Ensure wedge is symmetrical and seals equally well with flow in either direction.

4. Provide ductile iron operator nut with four (4) flats at stem connection to apply even input torque to the stem.

5. Bolts: AWWA C515, Section 4.4.4, Stainless Steel; cadmium plated or zinc coated.

6. Provide high strength bronze stem and nut.

7. O-rings: AWWA C515, Section 4.2.2.5, pressure O-rings as gaskets.

8. Provide stem sealed by three (3) O-rings. Top two (2) O-rings are to be replaceable with valve fully open at full rated working pressure.

9. Provide thrust washers to the thrust collar for easy valve operation.

I. Gate Valves Extension Stem: When shown on the Drawings, provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than four feet (4 Ft) from finished grade or as shown on the Drawings. Support extension stem with an arm attached to wall of manhole or structure that loosely holds extension stem and allows rotation in the axial direction only.

J. Gate Valves in Factory Mutual (Fire Service) Type Meter Installations: Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters Laboratories, Inc.; flanged, Class 125; clockwise to close.

K. Gate Valves for Tapping Steel Pipe: Provide double disc gate valve. Resilient wedge gate valve shall only be installed in a vertical position.

L. Provide flanged joints when valve is connected to steel or PCCP.

PART III: EXECUTION

3.1 INSTALLATION

A. Earthwork: Conform to applicable provisions of Section 02125 Excavation and Backfill for Utilities.

B. Operation: Do not use valves for throttling without prior approval of the manufacturer.

3.2 SETTING VALVES AND VALVE BOXES

A. Remove foreign matter from within valves prior to installation. Inspect valves in open and closed positions to verify that parts are in satisfactory working condition.

B. Install valves and valve boxes where shown on the Drawings. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of four feet (4 Ft) or to undisturbed trench face when less than four feet (4 Ft). Install valves completely closed when placed in water line.

C. For pipe section of each riser, use only six inch (6 In), ductile iron Class 51 or DR18 PVC pipe cut to proper length. Riser must be installed to allow complete access for operation of valve. Assemble and brace box in vertical position as indicated on the Drawings.

3.3 DISINFECTION AND TESTING

A. Contractor shall disinfect valves and appurtenances as required by Section 02455 Disinfection of Waterlines and test as required by Section 02450 Hydrostatic Testing of Waterlines.

B. Double-Disc Gate Valves: Apply hydrostatic test pressure equal to twice rated working pressure of valve between discs. Valve shall show no leakage through metal, flanged joints or stem seals. Test at rated working pressure, applied between discs. Valve shall show no leakage through metal, flanged joints or stem seals. Do not exceed leakage rate of one ounce per hour per inch (1 Oz/Hr/In) of nominal valve size.

C. Solid-Wedge Gate Valves: Apply hydrostatic pressure equal to twice rated working pressure of valve with both ends bulkheaded and gate open. Valve shall show no leakage through metal, flanged joints or stem seals. Test at rated working pressure, applied through bulkheads alternately to each side of closed gate with opposite side open for inspection. Valve shall show no leakage through metal, flanged joints

or stem-seals. Do not exceed leakage rate of one ounce per hour per inch (1 Oz/Hr/In) of nominal valve size.

D. Repair or replace valves which exceed leakage rate.

3.4 PAINTING OF VALVES

A. Paint valves in vaults, stations and above ground with approved paint.

END OF SECTION

SECTION 02415

PRESSURE REDUCING VALVES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Pressure reducing valves (PRV).

1.2 MEASUREMENT AND PAYMENT

A. A unit prices:

1. Payment for pressure reducing valves is on a unit price basis for each valve installed.

2. Payment includes vault, piping, manhole, fittings and appurtenances necessary for complete installation of valve.

3. Refer to Section 01270 Measurement and Payment for a unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is a Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASME American Society of Mechanical Engineers.

1. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM American Society for Testing and Materials.

1. ASTM A48 Standard Specification for Gray Iron Castings.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

5. Section 02450 Hydrostatic Testing of Waterlines.

6. Section 02455 Disinfection of Waterlines.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturer s product data for proposed valves for approval.

C. Submit design calculations and shop drawings for valve vaults and manholes, sealed by a Professional Engineer licensed by the State of Texas.

1.5 QUALITY CONTROL

A. Submit manufacturer s affidavit that pressure reducing valves purchased for the Work, were manufactured and tested in the United States and conform to requirements of this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Provide approved PRV with basket strainer in location and arrangement as shown on the Drawings.

1. Valve body: Ductile iron with ASME B16.1, Class 125, flanges.

2. Valve cover: ASTM A48 cast iron.

3. Valve internals:

a. Provide top and bottom single moving disc and diaphragm assembly.

b. Use flexible nylon fabric reinforced elastomer diaphragm integral with assembly.

c. Provide valve internal trim (seat ring, disc guide and cover bearing) made of stainless steel.

d. Provide heat-fusion bonded epoxy coating to internal

and external surfaces of valve body including disc retainer and diaphragm washer. Holiday-test coating applied to valve body.

e. Treat stem and seat with penetrative salt nitride process.

f. Use Xylan coated seat.

g. Do not use leather parts.

B. Control Tubing: Contain shutoff cocks with Y-strainer.

C. PRV: Equip with visual valve position indicator. Fit valve position indicator with air-bleed petcock. Authorized manufacturer s representative to initially set pressure in field with sixty pounds per square inch (60 psi) downstream pressure.

D. Provide basket strainer upstream of PRV as shown on the Drawings.

1. Strainer body: Quick-opening type, fabricated-steel construction with ANSI B 16.1, Class 150, flanges.

2. Basket: Type 304, stainless steel.

3. Model: Provide basket compatible with the manufacturer of the pressure reducing valve. Hayward Model 90 or approved equal, for PRV four inches (4 In) through twenty-four inches (24 In). Provide Hayward Model 510 or approved equal, for PRV fourteen inches (14 In) or greater when space limitations dictate use of smaller strainer housing.

E. Provide pressure reducing pilot that has adjustable range of twenty pounds per square inch (20 psi) to one hundred seventy-five pounds per square inch (175 psi). Provide and install pilot system components according to manufacturer's recommendations unless otherwise approved by the Project Manager.

F. Valve Vaults: Provide as shown on the Drawings and conforming to requirements of Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

PART III: EXECUTION

3.1 EARTHWORK

A. Conform to applicable provisions of Section 02125 □ Excavation and Backfill for Utilities.

3.2 SETTING VALVES

A. Provide services of authorized representative of valve manufacturer on site during installation of valves and to serve as adviser on aspects of installation. Take necessary precautions to protect pilot system during PRV installation.

B. Prior to installing valves, remove foreign matter from within valves. Inspect valves in open and closed position to verify that parts are in satisfactory working condition.

3.3 DISINFECTION AND TESTING

A. Disinfect valves and appurtenances as required by Section 02455 □ Disinfection of Waterlines and test as required by Section 02450 □ Hydrostatic Testing of Waterlines.

3.4 PAINTING OF PIPING AND VALVES

A. Paint piping and valves located in vaults, stations and above ground using ACRO Paint No. 2215 or approved equal.

END OF SECTION

SECTION 02420

TAPPING SLEEVES AND VALVES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Tapping sleeves and valves for connections to existing water system.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment is on a unit price basis for each tap installed.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

3. For water lines four inches (4 In) and greater, no payment shall be made until coupon (cut out portion of pipe tapped) is delivered to the City.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A240 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.

2. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

3. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service.

B. AWWA American Water Works Association.

1. AWWA C110 Standard for Ductile-Iron and Gray-Iron Fittings,

3 in. through 48 in., for Water and other Liquids.

2. AWWA C200 □ Standard for Steel Water Pipe □ 6 in. and Larger.

3. AWWA C207 □ Standard for Steel Pipe Flanges for Waterworks Service □ Sizes 4 in. through 144 in.

4. AWWA C223 □ Standard for Fabricated Steel and Stainless Steel Tapping Sleeves.

5. AWWA C500 □ Standard for Metal Seated Gate Valves, for Water Supply Service.

C. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02125 □ Excavation and Backfill for Utilities.

4. Section 02260 □ Polyethylene Wrap.

5. Section 02410 □ Gate Valves.

6. Section 02440 □ Valve Boxes, Meter Boxes and Meter Vaults.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit results of tapping sleeves NPT test opening.

C. Submit manufacturer□s affidavit as required in Section 02410 □ Gate Valves.

1.5 DELIVERY, STORAGE AND HANDLING

A. Ship steel sleeves in wooden crates that provide protection from damage to epoxy coating during transport and storage.

PART II: PRODUCTS

2.1 MATERIALS

A. Tapping Sleeves:

1. Tapping Sleeve Bodies: AWWA C223 stainless steel, full circumference to be bolted together with high-strength, corrosion-resistant, low-alloy steel bolts with mechanical joint ends.

2. Branch Outlet of Tapping Sleeve:

   a. Flanged, machined recess, AWWA C207, Class D, ANSI 150 pound drilling.

   b. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.

B. Stainless Steel tapping-sleeve bodies and flange shall be used for following sizes and with following restrictions:

1. Flange: ASTM A240 Stainless Steel, Type 304, ANSI 150 pound drilling.

2. Gasket: Full circumferential, affixed around recess of tap opening to prevent rolling or binding during installation, compounded for water and sewer service.

3. Stainless Steel sleeves are restricted to use on pipe sizes four inches (4 In) and larger.

4. Body: ASTM A240 Stainless Steel, Type 304.

5. Bolts: ASTM A193 Stainless Steel, Type 304.

6. Nuts: ASTM A194 Stainless Steel, Type 304.

7. Branch Outlet: Heavy Stainless Steel Pipe

8. Provide approved stainless steel tapping sleeves.

9. Do not use stainless steel sleeves for taps greater than seventy-five percent (75%) of pipe diameter.

C. Welded-steel tapping-sleeve bodies may be used in lieu of cast or

ductile iron bodies for following sizes and with following restrictions:

1. Flange: AWWA C207, Class D, ANSI 150 pound drilling.

2. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.

3. Steel sleeves are restricted to use on pipe sizes six inches (6 In) and larger.

4. Body: Heavy, welded-steel construction; top half grooved to retain neoprene O-ring seal permanently against outside diameter of pipe.

5. Bolts: AWWA C500 Section 3.5; coated with one hundred percent (100%) vinyl resin or corrosive resistant material.

6. Steel Sleeves Finish: Fusion-bonded epoxy coated to minimum twelve (12) mil thickness.

7. Finished Epoxy Coat: Free of laminations and blisters; and remain pliant and resistant to impact with non-peel finish.

8. Provide approved steel tapping sleeves.

9. Tapping Sleeves: Provide with three-quarters inch (3/4 In) NPT test opening for testing prior to tapping. Provide three-quarters inch (3/4 In) bronze plug for opening.

10. Do not use steel sleeves for taps greater than seventy-five percent (75%) of pipe diameter.

D. Tapping Valves: Meet requirements of Section 02410 Gate Valves with following exceptions:

1. Inlet Flanges:

   a. AWWA C110; Class 125.

   b. AWWA C110; Class 150 and higher: Minimum eight (8) hole flange.

2. Outlet: Standard mechanical or push-on joint to fit any standard tapping machine.

3. Valve Seat Opening: Accommodate full-size shell cutter for

nominal size tap without contact with valve body; double disc.

4. Valves must be open left (counterclockwise).

F. Valve Boxes: Standard Type "A" valve boxes conforming to requirements of Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

PART III: EXECUTION

3.1 APPLICATION

A. Install tapping sleeves and valves at locations and of sizes shown on the Drawings. Install sleeve so valve is in horizontally level position unless otherwise indicated on the Drawings or approved by the Project Manager.

B. Clean tapping sleeve, tapping valve and pipe prior to installation and in accordance with manufacturer s instructions.

C. When tapping concrete pressure pipe, size on size, use shell cutter one (1) standard size smaller than water line being tapped.

D. Do not use Large End Bell (LEB) increasers with next size tap unless existing pipe is asbestos-cement.

3.2 INSTALLATION

A. Verify outside diameter of pipe to be tapped prior to ordering sleeve.

B. Tighten bolts in proper sequence so that undue stress is not placed on pipe.

C. Align tapping valve properly and attach to tapping sleeve. Insert insulation sleeves into flange holes of tapping valve and pipe. Make insertions of sleeves on pipe side of tapping valve. Do not damage insulation sleeves during bolt tightening process.

D. Make tap with sharp, shell cutter:

1. For twelve inch (12 In) and smaller tap, use minimum cutter diameter one-half inch (1/2 In) less than nominal tap size.

2. For sixteen inch (16 In) and larger tap, use manufacturer s recommended cutter diameter.

E. Withdraw coupon and flush cuttings from newly-made tap.

F. Wrap:

1. For twelve inch (12 In) and smaller tap, wrap completed tapping sleeve and valve in accordance with Section 02260 Polyethylene Wrap.

2. For sixteen inch (16 In) and larger tap, apply coal tar epoxy around completed tapping sleeve and valve. The coal tar epoxy shall be applied with minimum of two (2) coats. Each coat of coal tar epoxy shall have minimum dry film thickness of sixteen (16) mils.

G. Place concrete thrust block behind tapping sleeve (not over tapping sleeve and valve).

H. Request inspection of installation prior to backfilling.

I. Backfill in accordance with Section 02125 Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02425

WATER METERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Water meters, sub-meters, irrigation meters and fire service meters.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Measurement for water meters is on a unit price basis for installation of each meter type and size.

2. Payment includes vault, piping and appurtenances necessary for complete installation of meter.

3. Measurement for relocating and reinstalling meter with new box is on a unit price basis for each meter relocated and reinstalled.

4. No separate payment for adjustment of meter or meter box unless otherwise shown in the Drawings.

5. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work is in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASME □ American Society of Mechanical Engineers.

1. ASME B16.1 □ Cast-Iron Pipe Flanges and Flanged Fittings.

B. AWWA □ American Water Works Association.

1. AWWA C510 □ Standard for Double Check Valve Backflow □ Prevention Assembly.

2. AWWA C700 – Standard for Cold-Water Meters – Displacement Type.

3. AWWA C701 – Standard for Cold-Water Meters – Turbine Type for Customer Service.

4. AWWA C702 – Standard for Cold-Water Meters – Compound Type.

5. AWWA C703 – Standard for Cold-Water Meters – Fire Service Type.

6. AWWA Manual M6 – Water Meters – Selection, Installation, Testing and Maintenance.

C. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02215 – Ductile Iron Pipe (DIP) and Fittings.

4. Section 02235 – Polyvinyl Chloride (PVC) Pipe.

5. Section 02420 – Tapping Sleeves and Valves.

6. Section 02430 – Water Tap and Service Line Installation.

7. Section 02440 – Valve Boxes, Meter Boxes and Meter Vaults.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit written certification of calibration and test results.

C. Submit manufacturer's certification that meters meet applicable requirements of this Specification Section.

D. Submit accuracy registration test certification from manufacturer for each three inch (3 In) through ten inch (10 In) diameter meter.

1.5 QUALITY CONTROL

A. Submit manufacturer's warranty against defects in materials and

workmanship for one year (1 Yr) from date of Substantial Completion.

B. Provide vendor's unconditional guarantee that performance of each meter meets applicable AWWA standards and AWWA Manual M6 as follows:

1. Displacement type: Ten years (10 Yrs) from installation or register registration specified in TABLE 4.1 GALLON REGISTRATION in this Section, whichever comes first.

2. Turbine type: One year (1 Yr) from date of installation.

3. Compound type: One year (1 Yr) from date of installation.

4. Fire service type: One year (1 Yr) from date of installation.

5. Operations of hermetically sealed register, one inch (1 In) to two inch (2 In) diameter, shall be unconditionally guaranteed for fifteen years (15 Yrs).

C. Provide manufacturer's unconditional guarantee for each sealed register against leakage, fogging, discoloration and stoppage for fifteen years (15 Yrs) from date of installation.

D. Vendor shall replace meters that become defective within guarantee period with meters that comply with this Technical Specification. The City shall return defective meters to vendor at vendor's expense. Meters repaired or replaced under this guarantee must meet accuracy limits for new meters upon receipt and accuracy limits for remaining period of guarantee for the original meter.

1.6 EASEMENT REQUIREMENTS

A. Install water meters and shut-off valves (stop boxes) in the City right-of-way line when possible.

B. When not possible to install water meters and shut-off valves (stop boxes) in the right-of-way, then install in utility easement, if available.

PART II: PRODUCTS

2.1 GENERAL

A. Provide meters of size as indicated on the Drawings, unless otherwise indicated.

B. Meters shall be Neptune. NO EXCEPTIONS.

C. Provide bolted split casings. Main casings of meters and external fasteners: Copper alloy with minimum seventy-five percent (75%) copper for one inch (1 In) to two inches (2 In), bronze or cast iron, hot-dipped galvanized or epoxy coating for three inches (3 In) and larger.

D. Straightening Vanes: Non-corrosive material compatible with case material.

E. Intermediate gear train shall not come into contact with water and shall operate in suitable lubricant.

F. Registers:

1. Lens: impact resistant.

2. Register box: tamper resistant by means of tamper screw or plug.

3. Register capacity of meters:

a. One inch (1 In) meters: nine million nine hundred ninety-nine thousand nine hundred and ninety gallons (9999990 Gal). There shall be six (6) mobile and one (1) stationary digits. The last digit shall be stationary, white on black background. The tens and hundreds digits shall be mobile and white on a black background. The first four digits (millions to thousands) shall be black on a white background.

b. Two inch (2 In) meters and larger: ninety-nine million nine hundred ninety-nine thousand nine hundred gallons (99999900 Gal). There shall be six (6) mobile and two (2) stationary digits. The last two digits shall be stationary, white on black background. The hundreds digit shall be mobile and white on a black background. The first four digits (tens of millions to thousands) shall be black on a white background.

4. If used, Automatic Meter Reading (AMR), shall adhere to the following: provides pulse, contact closure, piezo switch or encoder generated output signal, compatible with the City's radio and telephone AMR systems. Provide minimum twelve foot (12 ft) wire when permanently connected to register. Register box: tamper resistant by means of tamper screw or

plug: Register: permanently sealed, straight-reading, center-sweep test hand, magnetic driven, U.S. gallons.

G. Connections: one inch (1 In: threads at each end; one and one-half inches (1-1/2 In) to two inches (2 In): two (2) bolt oval flanges each end; three inches (3 In) and larger: flange at each end.

1. Connections three inches (3 In) or larger shall be in a vault and shall have a by-pass.

H. Stamp manufacturer's meter serial number on outer case. Stamp manufacturer's meter serial number on outside of register lid when provided. Manufacturer's serial numbers shall be individual and not duplicated.

I. Meters: Provide approved meters equipped with AMR type register to connect to the City of Friendswood's AMR system, when required.

J. Manufacturing quality control shall permit successful interchangeability from one (1) meter to another of same size including registers, measuring chambers and units, discs or pistons as units, change gears, bolts, nuts and washers without affecting accuracy of new meter.

K. For water meter vaults provide:

1. One-quarter inch (1/4 In) steel or aluminum with stainless steel hinge pins. Door shall open to ninety degrees (90°) and automatically lock in that position.

2. Provide approved meter vault covers.

2.2 METER APPLICATIONS

A. Sizes one inch (1 In) to two inch (2 In) Meters: Displacement type [except for constant flow where two inch (2 In) turbine may apply].

B. Sizes three inch (3 In) and above Meters:

1. Turbines:

a. Processing plants

b. Manufacturing facilities

c. Lawn sprinkler systems

d. Effluent water in treatment plants

e. Booster (pump) stations

f. Level controlled tank filling operations

g. Fire hydrants (transients)

h. Inter-systems sale or transfer

i. Sewer credit/sub-meter

2. Compounds:

a. Multi-family dwellings

b. Motels and hotels

c. Hospitals

d. Schools

e. Restaurants

f. Office buildings

g. Dormitories, nursing homes, department stores, shopping malls and other commercial establishments

Note: Provide fire service type meter for sizes larger than six inches (6 In).

3. Fire Service Type: For designated fire protection lines. Provide proportional or compound type fire service meter assembly (AWWA C703) when customer elects to use combination of potable and fire protection services in lieu of separate domestic meters and fire services.

2.3 MATERIALS

A. Cold-Water Meters:

1. Displacement Type: AWWA C700; sizes one inch (1 In) up to and including two inches (2 In); oscillating disc or piston of magnetic drive type; bolted split-case design, with either being removable.

2. Turbine Type: AWWA C701; Class II; sizes three inches (3 In) through ten inches (10 In); flanged; straight-through measuring chamber; rotor construction: polypropylene or similar non-rubber material with specific gravity of approximately 1.0, equipped with near frictionless replaceable bearings in turbine working against rotor shaft positioned thrust bearing. Transient/Fire Hydrant Meter Inlet: Female fitting for attachment to hose nozzle with National Standard Fire hose thread. Outlet: two inch (2 In) nipple with National Pipe Thread. Include restriction plate to limit flow through meter to four hundred gallons per minute (400 gpm) at sixty-five pounds per square inch (65 psi).

3. Compound Type: AWWA C702; sizes two inches (2 In) through six inches (6 In). Measuring chambers: For use in continuous operation; separate units of copper alloy [minimum eighty-four percent (84%) copper] or approved polymer material, inert in corrosive potable water; with centering device for proper positioning. Measuring pistons: Non-pilot type with division plates of rubber covering vulcanized to stainless steel or other approved material of sufficient thickness to provide minimum piston oscillation noise. Measuring discs: Flat or conical type, one piece, mounted on monel or 316 stainless steel spindle. Measuring chamber strainer screen area: Twice area of main case inlet.

4. Fire-Service Type: sizes four inches (4 In) through ten inches (10 In); turbine-type, compound type, proportional type; AWWA C703, with separate check valve conforming to AWWA C510. Determine size of fire meter by adding fire flow and domestic flow.

2.4 STRAINERS

A. Displacement Potable Water Meters one inch (1 In) through two inches (2 In): Self-straining by means of annular space between measuring chamber and external case or with strainer screens installed in meter. Provide rigid screens which fit snugly, are easy to remove, with effective straining area at least double that of main case inlet.

B. Potable Water Meters two inch (2 In) diameter and larger: Equip with separate external strainer with bronze body for diameters less than eight inches (8 In). Eight inch (8 In) diameter and larger may be cast iron, hot-dipped galvanized or epoxy coating. Strainers: Bolted to inlet side of meter, detachable from meter, easily removable lid. Strainer

screen: Made of rounded cast bronze, stainless steel wire, having nominal screen size of three and one half (3-1/2) mesh-per-inch (U.S. Series) not less than forty-five percent (45%) clear area.

C. Provide separate approved external strainers (when required by meter manufacturer) approved for use in fire service metered connections by Underwriters Laboratories. Bodies: Cast iron or copper alloy. Ends: Flanged in accordance with ASME B16.1, Class 125. Provide stainless steel basket. Strainers shall be detachable from meter.

2.5 CONNECTIONS AND FITTINGS

A. Provide pipe for connections in accordance with Section 02215 Ductile Iron Pipe (DIP) and Fittings and Section 02235 Polyvinyl Chloride (PVC) Pipe. Use restrained joints and flanged joints only.

B. Fittings:

1. For meters two inches (2 In) and smaller: Same type of fittings as Outlet End fittings for Curb Stop in accordance with Section 02430 Water Tap and Service Line Installation.

2. For meters three inches (3 In) and larger: Restrained ductile iron; push-on bell joints or mechanical joint fittings between water line and meter vault; Class 125 flanged inside meter vaults; cement mortar lined and sealed.

2.6 LAYING LENGTHS

A. Minimum laying lengths for meter and standard strainer shall be as shown on the Drawings.

PART III: EXECUTION

3.1 TAPPING AND METER SERVICE INSTALLATION

A. Refer to Section 02420 Tapping Sleeves and Valves for tapping requirements.

B. Meter Service Line:

1. Use pipe and fittings conforming to requirements of Section 02215 Ductile Iron Pipe (DIP) and Fittings or Section 02235 Polyvinyl Chloride (PVC) Pipe.

2. Limit pulling and deflecting of joints to limits recommended by

manufacturer.

3. Make vertical adjustments with offset bends where room shall permit. Minimize number of bends.

4. Provide minimum of ten (10) pipe diameters of straight pipe length upstream and downstream of meter vault.

3.2 METER FITTING HOOKUP

A. Support meter piping and meter, level and plumb, during installation. Support meters three inches (3 In) and larger with concrete at minimum of two (2) locations.

B. Use round flanged fittings inside meter box or vault except for mechanical joint to flange adapter. Provide full-face one-eighth inch (1/8 In) black neoprene or red rubber gasket material on flanged joints. Provide bolts and nuts made from approved corrosion-resistant material.

C. Tighten bolts in proper sequence and to correct torque.

D. Visually check for leaks under normal operating pressure following installation. Repair or replace leaking components.

3.3 METER BOX AND VAULT INSTALLATION

A. Conform to requirements of Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

B. Perform adjustment to existing meter in accordance with Section 02440 Valve Boxes, Meter Boxes and Meter Vaults.

C. Meters three inches (3 In) and larger shall be installed in a meter vault conforming to requirements of Section 02440 Valves Boxes, Meter Boxes and Meter Vaults, and shall have by-pass installed.

3.4 TESTING

A. Accuracy registration tests shall be conducted in accordance with latest revision of AWWA standard for type and size of meter.

1. Tests shall be run by manufacturer prior to shipping to the City of Friendswood. Meters may be tested at random at the City's discretion.

2. Accuracy of displacement meters during guarantee period shall be as follows:

   a. Initial period: Eighteen months (18 Mos) from date of shipment or twelve months (12 Mos) from date of installation: ninety-eight and one-half percent (98.5%) to one hundred one and one-half percent (101.5%) at standard and minimum flow rates; ninety-eight percent (98%) to one hundred and one percent (101%) at low flow rates.

   b. Second period: AWWA new meter accuracy tested as specified in TABLE 4.2 □ METER TEST FLOW RATE □ 2ND PERIOD in this Section.

   c. Third period: AWWA new meter accuracy for standard flow rates and AWWA repair meter accuracy for minimum flow rate tested in TABLE 4.3 □ METER TEST FLOW RATE □ 3RD PERIOD.

3. Minimal acceptable accuracy in percent of low flow registration for turbine meters shall be as specified in TABLE 4.4 □ MINIMAL ACCEPTABLE ACCURACY FOR METERS in this Section.

PART IV: TABLES

4.1 □ GALLON REGISTRATION

Size (inch)	Registration (million gallons)
5/8, 3/4	1.5
1	2.5
1-1/2	5.0
2	10.5

4.2 METER TEST FLOW RATE

GUARANTEE PERIOD			TEST FLOW RATE
Meter Size (inches)	Age of Meter (years)	Or Gallons (million*)	Rate (gpm)
5/8	>1 to <5	0.5	1/4
1	>1 to <5	1.0	3/4
1-1/2	>1 to <5	2.5	1-1/2
2	>1 to <5	5.5	2

* Total Registration

4.3 METER TEST FLOW RATE 3RD PERIOD

GUARANTEE PERIOD			TEST FLOW RATE
Meter Size (inches)	Age of Meter (years)	Or Gallons (million*)	Rate (gpm)
5/8	>5 to <10	1.5	1/4
1	>5 to <10	2.5	3/4
1-1/2	>5 to <10	5.0	1-1/2
2	>5 to <10	10.0	2

* Total Registration

4.4 MINIMAL ACCEPTABLE ACCURACY FOR METERS

Meter Size (inches)	Minimum Flow (gpm)	% Accuracy Required
2	3	95
3	5	95
4	15	95
6	20	95
8	20	95
10	30	95

END OF SECTION

SECTION 02430

WATER TAP AND SERVICE LINE INSTALLATION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Tapping existing mains and furnishing and installing new service lines for water.

B. Relocation of existing small water meters.

C. The Technical Specifications identify requirements for both small-diameter [less than or equal to twenty inches (20 In)] water lines and large-diameter [greater than twenty inches (20 In)] water lines. When the Specifications for large-diameter water lines differ from those for small-diameter water lines, paragraphs for large-diameter water lines shall govern for large-diameter pipe.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for water taps and service lines three-quarters inch (3/4 In) through one inch (1 In) is on a unit price basis for each installation. Separate measurements shall be made for "short side", "long side" and "extra long side" connections as defined in Paragraph 1.4, Definitions.

2. Payment for water taps and service lines one and one-half inch (1-1/2 In) through two inch (2 In) is on a unit price basis for each installation. Separate measurements shall be made for "short side", "long side" and "extra long side" connections as defined in Paragraph 1.4, Definitions.

3. Payment for "short side", "long side" and "extra long side" includes locating water line, tap installation and connection to meter and restoring site.

4. Payment for each small meter includes labor, materials, and equipment to relocate existing small meter.

5. No additional payment shall be made for bedding, backfill,

compaction, push under pavement, etc.

6. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA American Water Works Association.

1. AWWA C800 Standard for Underground Service Line Valves and Fittings.

2. AWWA C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, four inch (4 In) through twelve inch (12 In), for Water Distribution.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02205 Copper Tubing.

5. Section 02230 Polyethylene Plastic Tubing (PE).

6. Section 02440 Valve Boxes, Meter Boxes, and Meter Vaults.

1.4 DEFINITIONS

A. Short Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water line on same side of street.

B. Long Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water line on opposite side of street or from center of streets where supply line is located in street center such as boulevards and streets with esplanades. Distance for long side connection shall not exceed sixty linear feet (60 Lf) at right angles to water line.

C. Extra-Long Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water line on opposite side of street or from center of street where supply line is located in street center such as boulevards and streets with esplanades. Distance for extra-long side connection is greater than sixty linear feet (60 Lf) at right angles to water line.

PART II: PRODUCTS

2.1 MATERIALS

A. Service Lines:

1. Copper Tubing: In accordance with Section 02205 Copper Tubing.

2. Polyethylene Tubing (PE): In accordance with Section 02230 Polyethylene Plastic Tubing (PE).

3. Polybutylene tubing is not permitted.

B. Corporation Stops: AWWA C800 as modified in this Section:

1. Inlet End: AWWA standard thread.

2. Valve Body: Tapered plug type, O-ring seat ball type, or rubber seat ball type.

3. Outlet End: Compression connection for use with Type K, soft copper or compression type fitting.

C. Provide taps for water line types and sizes in as specified in TABLE 4.1 PIPE TAPPING SCHEDULE in this Section.

D. Dual Strap Saddles: Red brass body and straps; ductile-iron; vinyl-coated body and straps; or ductile-iron, vinyl-coated body and stainless-steel straps.

E. Taps for PVC Water Lines: Use dual-strap or single, wide-band strap saddles which provide full support around circumference of pipe and bearing area of sufficient width along axis of pipe, two inches (2 In) minimum, ensuring that pipe shall not be distorted when saddle is tightened. Provide approved stainless-steel tapping saddle with AWWA standard thread.

F. Taps for Steel Pipe: Not allowed.

G. Curb Stops and Brass Fittings: AWWA C800 as modified in this Section.

1. Inlet End: Compression-type fitting

2. Valve Body: Straight-through or angled, meter-stop design equipped with following:

   a. O-ring seal straight plug type.

   b. Rubber seat ball type.

3. Outlet End: Female, iron-pipe thread or swivel-nut, meter-spud thread on three-quarters inch (3/4 In) and one inch (1 In) stops and two (2) hole flange on one and one-half inch (1-1/2 In) and two inch (2 In) sizes.

4. Fittings: Provide approved fittings. Use same size open end wrenches and tapping machines as used with respective fittings.

5. Factory Testing of Brass Fittings:

   a. Submerge in water for ten seconds (10 sec) at eighty-five pounds per square inch (85 psi) with stop in both closed and open positions.

   b. Reject fitting that shows air leakage: The Project Manager may confirm tests locally. Entire lot from which samples were taken shall be rejected when random sampling discloses unsatisfactory fittings.

H. Angle Stops: In accordance with AWWA C800; ground-key, stop type with bronze lockwing head stop cap; inlet and outlet threads conform to application tables of AWWA C800; and inlets flared connection or compression.

1. Outlet for three-quarter inch (3/4 In) and one inch (1 In) size: Meter swivel nut with saddle support.

2. Outlet for one and one-half inch (1-1/2 In) through two inch (2 In) size: O-ring sealed meter flange, iron pipe threads.

I. Fittings: In accordance with AWWA C800 and following:

1. Castings: Smooth, free from burrs, scales, blisters, sand holes, and defects which would make them unfit for intended use.

2. Nuts: Smooth cast and has symmetrical hexagonal wrench flats.

3. Flare-Joint Fittings: Smooth cast. Machine seating surfaces for metal-to-metal seal to proper taper or curve, free from pits or protrusions.

4. Thread fittings, of all types, shall have N.P.T. or AWWA threads, and protect male threaded ends in shipment by plastic coating, or approved equal.

5. Compression tube fittings shall have Buna-N beveled gasket.

6. Stamp of manufacturer's name or trademark and of fitting size shall be on the body.

PART III: EXECUTION

3.1 GENERAL

A. For service lines and lateral connections larger than those allowed in Pipe Tapping Schedule, branch connections and multiple taps may be used. Space corporation stops a minimum of two feet (2 Ft) apart.

B. Tapped collars of appropriate sizes: Approved in new construction only provided they are set at right angles to proposed meter location.

C. Use tapping machine manufactured for pressure tapping purposes for two inch (2 In) and smaller service taps on pressurized water lines.

D. For new meter or when existing meter is in conflict with proposed pavement improvements, locate water meters one foot (1 Ft) inside the City right-of-way, or when this is not feasible, one foot (1 Ft) on curb side of sidewalk if sufficient right-of-way is available. Contact the Project Manager when major landscaping or trees conflict with service line and meter box location. No additional payment shall be made for work on customer side of meter.

E. New location and installation of existing small meter shall conform to requirements of this Section.

3.2 SERVICE INSTALLATION

A. Set service taps at right angles to proposed meter location and locate taps in upper pipe segment within forty-five degrees (45°) of pipe springline.

B. Install service lines in open-cut trench in accordance with Section 02125 Excavation and Backfill for Utilities. Install service lines under paved roadways, other paved areas and areas indicated on the Drawings in bored hole.

C. Lay service lines with minimum of thirty inches (30 In) of cover as measured from top of curb or in absence of curbs, from centerline elevation of crowned streets or roads. Provide minimum of eighteen inches (18 In) of cover below flow line of ditches to service lines.

D. Service lines across existing street (push-unders): Pull service line through prepared hole under paving. Use only full lengths of tubing. Take care not to damage copper tubing when pulling it through hole. Compression-type union shall be permitted only when span underneath pavement cannot be accomplished with a full standard length of tubing. Use only one (1) compression-type union for each full length of tubing.

E. Maintain service lines free of dirt and foreign matter.

F. Install service lines so that top of meter shall be eight inches (8 In) to twelve inches (12 In) below finished grade.

G. Anticipate existing sanitary sewers to have cement-stabilized sand backfill to bottom of pavement. Include cost of such crossings in the unit price for services.

3.3 CURB STOP INSTALLATION

A. Set curb stops or angle stops at outer end of service line inside of meter box. Secure opening in curb stop to prevent unwanted material from entering. In close quarters, make S-curve in field. Do not flatten tube. In three-quarter inch (3/4 In) and one inch (1 In) services, install meter coupling, swivel-nut, or curb stop ahead of meter. Install straight meter coupling on outlet end of meter.

3.4 SEQUENCE OF OPERATIONS

A. Open trench for proposed service line in accordance with Section 02125 Excavation and Backfill for Utilities.

B. Install curb stop on meter end of service line.

C. With curb stop open and prior to connecting service line to meter in slack position, open corporation stop and flush service line thoroughly. Close curb stop, leaving corporation stop in full-open position.

D. Check service line for apparent leaks. Repair leaks before proceeding.

E. Schedule inspection with the Project Manager prior to backfilling. After inspection, backfill in accordance with Section 02125 Excavation and Backfill for Utilities.

F. Install meter box centered over meter with top of lid flush with finished grade. Meter box: Refer to Section 02440 Valve Boxes, Meter Boxes, and Meter Vaults.

PART IV: TABLES

TABLE 4.1 □PIPE TAPPING SCHEDULE

PIPE TAPPING SCHEDULE				
WATERLINE TYPE AND DIAMETER	SERVICE SIZE			
	3/4□	1□	1-1/2□	2□
4□Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
4□Asbestos Cement	WBSS	WBSS	DSS, WBSS	DSS, WBSS
4□PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6□and 8□Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6□and 8□ Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6□and 8□PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
10□and 12□Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
10 □and 12□ Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
10□and 12□PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16□and UP Cast Iron and Ductile Iron	DWBSS	DWBSS	DWBSS	DWBSS
16□and UP Asbestos Cement	DWBSS	DWBSS	DWBSS	DWBSS
16□and UP PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS □DUAL STRAP SADDLES
WBSS □WIDE BAND STRAP SADDLES
DWBSS □DUAL WIDE BAND STRAP SADDLES

END OF SECTION

SECTION 02435

FIRE HYDRANT ASSEMBLIES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Fire hydrants.

B. Adjustment of fire hydrants and gate valves.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment is on a unit price basis for each fire hydrant assembly, including six inch (6 In) gate valve and box, installed regardless of barrel depth.

2. Payment for fire hydrant branches (leads) is on linear foot basis for each branch installed. Separate pay items are used for open-cut and augered branches.

3. No separate payment for salvaged fire hydrants returned to the City's Public Works yard.

4. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA – American Water Works Association.

1. AWWA C550 – Standard for Protective Epoxy Interior Coatings for Valves and Hydrants

2. AWWA C502 – Standard for Dry-Barrel Fire Hydrants

3. AWWA C503 – Standard for Wet-Barrel Fire Hydrants

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 01580 Waste Material Disposal.
4. Section 02215 Ductile Iron Pipe (DIP) and Fittings.
5. Section 02235 Polyvinyl Chloride Pipe (PVC).
6. Section 02250 Steel Pipe and Fittings.
7. Section 02400 Water Lines.

C. Federal Standard A-A-2962A Enamel, Alkyd, Solvent Based Low VOC.

D. SSPC Steel Structures Painting Council.

1. SSPC SP2 Hand Tool Cleaning.
2. SSPC SP3 Power Tool Cleaning.
3. SSPC SP10 Near-White Blast Cleaning.
4. SSPC SP11 Power Tool Cleaning to Bare Metal.
5. SSPC Paint Spec No.21.
6. SSPC-Paint 21 White or Colored Silicone Alkyd Paint.
7. SSPC-Paint 25 Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II.
8. SSPC-Paint 104 White or Tinted Alkyd Paint.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit name of hydrant manufacturer, type of bonnet paint and engineering control drawing number for hydrant proposed for use.

PART II: PRODUCTS

2.1 HYDRANTS

A. Provide approved fire hydrants.

B. The Project Manager may, at any time prior to or during installation of hydrants, randomly select furnished hydrant for disassembly and laboratory inspection, at the Contractor expense, to verify compliance with the Specifications. When hydrant is found to be non-compliant, replace, at the Contractor s expense, all hydrants with new hydrants that comply with the Specifications.

C. Provide lower hydrant barrel fabricated from Ductile Iron Pipe (DIP) as single piece, connected to upper hydrant barrel by means of joint coupling that shall provide three hundred sixty degree (360°) rotation of upper barrel.

D. Fire Hydrants shall be Mueller or American Darling. NO EXCEPTIONS.

2.2 LEADS

A. Branches (Leads): Conform to requirements of Section 02501 Ductile Iron Pipe (DIP) and Fittings, Section 02250 Steel Pipe and Fittings and Section 02235 Polyvinyl Chloride Pipe (PVC).

2.3 AUDITING

A. Cycle Fire Hydrant and Valve to seals, Plugs, etc.

B. Flow test each hydrant in accordance with AWWA C502, AWWA C503, and AWWA Manual M17 Installation, Field Testing and Maintenance of Fire Hydrants.

2.4 HYDRANT PAINTING

A. New hydrants and refurbished hydrants shall be coated as specified herein.

B. Exterior Above Traffic Flange (Including Bolts & Nuts).

1. Surface preparation to be in accordance with SSPC-SP 10 (MACE 2) near white blast cleaned surface.

2. Coat with three (3) coat alkyd/silicone alkyd system with total dry film thickness (DFT) of four (4) mils to six (6) mils as follows:

a. Prime Coat Tnemec Series 20 Epoxy Primer, to be in general conformance with SSPC Paint Specification No. 10. Total dry film thickness (DFT) two (2) mils to three (3) mils. Primer color shall be Grey.

b. Hydrant Barrels All hydrant barrels shall be painted red using Tnemec Series 76 Endura-Shield paint to be in general conformance with SSPC Paint Specification No. 104 and Federal Standard A-A-2962A. Total dry film thickness (DFT) of two (2) mils to three (3) mils. Barrel color shall be Ruby Red.

d. Bonnet Paint All bonnets shall be painted silver using 3M #7210 (reflective with glass) to be in general conformance with SSPC Paint Specification No. 21. Dry film thickness of two (2) mils to three (3) mils. Bonnet color shall be: Silver.

C. Field Maintenance Painting (Exterior Above Traffic Flange)

1. Surface Preparation to be in accordance with SSPC SP2, Hand Tool Cleaning or SSPC SP3, Power Tool Cleaning, depending on condition of existing paint and extent of corrosion. It is not necessary to remove tightly adhered mill scale, rust and paint. Mill scale, rust and paint are considered tightly adherent when they cannot be removed with dull putty knife. In some severe cases where it is necessary to remove the majority of existing paint, surface should be cleaned in accordance with SSPC SP11, Power Tool Cleaning to Bare Metal.

2. When surface is cleaned to bare metal (SSPC SP11), coat hydrant with two (2) coat Epoxy system in accordance with Paragraph 2.4.B.2 as for new hydrants. When surface is cleaned to SSPC SP2 or SSPC SP3, coat hydrant with Epoxy in general conformance with SSPC Paint Specification No. 104. Total dry film thickness of three (3) mils to six (6) mils.

PART III: EXECUTION

3.1 INSTALLATION

A. Set fire hydrant plumb and brace at locations and grades as shown on the Drawings.

B. Locate nozzle center line minimum eighteen inches (18 In) above finish

grade.

C. Place twelve inch by twelve inch (12 In x 12 In) yellow indicators (plastic, sheet metal, plywood or other material approved by the Project Manager) on pumper nozzles of new or relocated fire hydrants installed on new water lines not in service. Remove indicators after new water line is tested and approved by the Project Manager.

D. Do not cover drain ports when placing concrete thrust block.

E. Place pea gravel from top of pipe to six inches (6) above barrel connection as shown in the City of Friendswood Standard Details.

F. Obtain the Project Manager's approval in writing prior to installation of hydrants which require changes in bury depth due to obstructions not shown on the Drawings. Unit price adjustments shall not be allowed for changes in water line flow line or fire hydrant barrel length caused by obstructions.

G. Plug branch lines to valves and fire hydrants shown on the Drawings to be removed. Deliver fire hydrants designated for salvage to Public Works Facility.

H. Install branches (leads) in accordance with Section 02400 Water Lines.

I. Coating Requirements:

1. Apply coatings in strict accordance with manufacturer's recommendations. No requirements of this Technical Specification shall cancel or supersede written directions and recommendations of the specific manufacturer so as to jeopardize the integrity of an applied system.

2. Furnish affidavit of compliance that coatings furnished complies with requirements of this Technical Specification and referenced standards, as applicable.

J. Remove and dispose of unsuitable materials and debris in accordance with requirements of Section 01580 Waste Material Disposal.

END OF SECTION

SECTION 02440

VALVE BOXES, METER BOXES AND METER VAULTS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Valve boxes for water service.

B. Meter boxes for water service.

C. Meter vaults for water service.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for valve boxes under this Section. Include payment in the unit price for Section 02400 Water Lines.

2. No separate payment shall be made for meter boxes under this Section. Include payment in the unit price for Section 02430 Water Tap and Service Line Installation.

3. Payment for each size of meter vaults is on the unit price basis per vault. Payment shall be made for each vault installed, regardless of depth.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A48 Standard Specification for Gray Iron Castings.

2. ASTM D256 □ Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

3. ASTM D638 □ Standard Test Method for Tensile Properties of Plastics.

4. ASTM D648 □ Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

5. ASTM D790 □ Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials.

6. ASTM D2240 □ Standard Test Method for Rubber Property-Durometer Hardness.

B. CFTS □ City of Friendswood Technical Specifications

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 02125 □ Excavation and Backfill for Utilities.

4. Section 02140 □ Utility Backfill Materials.

5. Section 02215 □ Ductile Iron Pipe (DIP) and Fittings.

6. Section 02235 □ Polyvinyl Chloride Pipe (PVC).

7. Section 02315 □ Frames, Grates, Rings and Covers.

8. Section 02400 □ Water Lines.

9. Section 02430 □ Water Tap and Service Line Installation.

10. Section 02805 □ Concrete Paving.

11. Section 03200 □ Reinforcing Steel.

12. Section 03300 □ Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit manufacturers' product data for following items for approval:

1. Each type of valve box and lid.

2. Each type of meter box and cover.

3. Each type of meter vault frame and cover.

C. Submit design calculations and shop drawings for precast vault elements, sealed by a Professional Engineer licensed by the State of Texas.

D. Submit shop drawings for cast-in-place meter vaults for approval if proposed construction varies from the Drawings.

E. Submit manufacturer□s certification that plastic meter boxes meet requirements of Paragraph 2.5, Plastic Meter Boxes.

PART II: PRODUCTS

2.1 VALVE BOXES

A. Provide approved Type A, cast-iron/ductile-iron, slide-type, valve boxes. Design of valve box shall minimize stresses on valve imposed by loads on box lid.

B. Cast letter □W□ into lid, one-half inch (1/2 In) in height and raised three-thirty-seconds inch (3/32 In), for valves serving potable water lines.

C. Unless otherwise specified, constructed of uncoated cast iron.

D. Riser Pipe:

1. Provide six inch (6 In) PVC, Class 150, DR 18, riser pipes in accordance with Section 02235 □ Polyvinyl Chloride Pipe (PVC) or

2. Six inch (6 In) ductile-iron, thickness Class 51 riser pipes in accordance with Section 02215 □ Ductile Iron Pipe (DIP) and Fittings.

3. Provide single section of pipe.

E. Concrete for valve box placement:

1. For locations in new concrete pavement, provide strength and mix design of new pavement.

2. For other locations, provide concrete for sidewalks conforming to requirements of Section 02805 Concrete Paving.

F. Valve box lids are to be painted blue.

2.2 METER BOXES

A. Provide meter boxes for five-eighths inch (5/8 In) through one inch (1 In) meters of the following materials:

1. Non-traffic bearing locations: Cast iron, concrete or plastic.

2. Traffic bearing locations: Cast iron or concrete.

B. Provide meter boxes for one and one-half inch (1-1/2 In) and two inch (2 In) meters of concrete.

C. Provide meter box with reading lid: Provide lids with spring-type latching devices. Lids shall contain sufficient metal that meter box can be easily located with metal detector. Cast words CITY OF FRIENDSWOOD and "WATER METER" into lid with letters of one-half inch (1/2 In) height and raised three-thirty-seconds inch (3/32 In).

D. Meter box dimensions shall conform to the following approximate dimensions:

1. Length: At top fifteen and one-half inches (15-1/2 In); at bottom twenty inches (20 In).

2. Width: At top twelve and one-half inches (12-1/2 In); at bottom fourteen and three-quarters inches (14-3/4 In).

3. Height: Twelve inches (12 In).

E. Extensions: Meter box extensions three (3 In) inches and six inches (6 In) in height shall be available from the manufacturer as a standard item.

2.3 CAST-IRON METER BOXES

A. Cast-Iron Boxes: Clean and free from sand blow-holes or other defects

conforming to requirements of ASTM A48, Class 30B. Bearing surfaces shall be machined so that covers seat evenly in frames.

B. Boxes and lids shall have dipped, coal-tar-pitch, varnish finish.

C. Provide lock-type meter boxes when required by the Drawings. Lock mechanisms shall work with ease.

2.4 CONCRETE METER BOXES

A. Concrete Meter Boxes: Made of Class B concrete, with minimum four thousand pounds per square inch (4000 psi) compressive strength, conforming to requirements of Section 03300 Structural Concrete. Construct to dimensions shown on the Drawings.

B. Castings: Free from fractures, large or deep cracks, blisters or surface roughness or any other defects that may affect serviceability.

2.5 PLASTIC METER BOXES

A. Plastic Meter Boxes: Made of high density polyethylene conforming to the following ASTM standards:

1. ASTM REQUIREMENT:

a. D256 Impact Strength = One and nine-tenths foot-pounds per inch (1.9 Ft-Lb/In) (Izod, Notched).

b. D256 Impact Strength = Six and four-tenths foot-pounds per inch (6.4 Ft-Lb/In) (Izod, Un-Notched).

c. D638 Tensile Strength (2.0 min.) = Three thousand four hundred pounds per square inch (3400 psi).

d. D648 Deflection Temperature = One hundred seventy degrees Fahrenheit (170° F).

e. D2240 Shore D, Hardness, fifty-five (55) to sixty-five (65) Impact Strength, Falling Dart Method: One hundred sixty inch-pounds (160 In-Lb).

f. D790 Flexural Modulus = Ninety thousand pounds per square inch (90,000 psi).

B. Meter boxes shall meet the following test requirements:

1. Static Load: Not less than two thousand five hundred pounds (2500 psi) using six inch (6 In) disc with direct compression exerted at center of top of meter box with solid plastic lid.

2. Deflection: Not less than one thousand pounds (1000 Lbs) load required to deflect top edge of meter box one-eighth inch (1/8 In).

C. Meter box body, without lid, shall weigh approximately seven pounds (7 Lbs).

2.6 METER VAULTS

A. Meter vaults may be constructed of precast concrete or cast-in-place concrete unless a specific type of construction is required by the Drawings.

B. Concrete for Meter Vaults: Class B concrete, conforming to requirements of Section 03300 Structural Concrete with minimum compressive strength of four thousand pounds per square inch (4000 psi) at twenty-eight days (28 D).

C. Reinforcing steel for meter vaults: Conform to requirements of Section 03200 Reinforcing Steel.

D. Grates and Covers: Conform to requirements of Section 02315 Frames, Grates, Rings and Covers.

PART III: EXECUTION

3.1 EXAMINATION

A. Obtain approval from the Project Manager for exact location of meter vault.

B. Verify lines and grade are correct.

C. Verify compacted subgrade shall support loads imposed by vaults.

D. At no time shall a valve box, meter box or meter vault be installed in a driveway, sidewalk or wheelchair ramp.

3.2 VALVE BOXES

A. Install riser pipe with suitable length for depth of cover indicated on the Drawings or to accommodate actual finish grade.

1. Install with bell on top of valve.

2. Place riser pipe in plumb, vertical position.

B. Install valve box and riser piping plumbed in a vertical position. Provide six inches (6 In) telescoping freeboard space between riser pipe top butt end and interior contact flange of valve box, for vertical movement damping. End of riser pipe resting on valve shall be notched out sufficiently to provide a snug fit around the valve bonnet and to center valve inside of pipe.

C. Set, align and adjust valve box so that lid is level with final grade.

D. Install twenty-four inch by twenty-four inch (24 In x 24 In) concrete valve collar using Class A concrete, conforming to requirements of Section 03300 Structural Concrete with minimum compressive strength of three thousand pounds per square inch (3000 psi) at twenty-eight days (28 D).

E. Paint covers of new valve boxes in blue when installed for completion and acceptance by the City.

3.3 METER BOXES

A. Install cast iron or plastic boxes in accordance with manufacturer's instructions.

B. Construct concrete meter boxes to dimensions shown on the Drawings.

C. Adjust top of meter boxes to conform to cover elevations specified in Paragraph 3.5, Frame and Cover for Meter Vaults.

D. Do not locate under paved areas unless approved by the Project Manager. Use approved traffic type box with cast iron lid when meter must be located in paved areas.

E. Locate Meter Boxes in the City right-of-way, perpendicular to the centerline of the roadway.

3.4 METER VAULTS

A. Construct concrete meter vaults to dimensions shown on the Drawings. Do not cast in presence of water. Make bottom uniform. Verify lines and grades are correct and compacted subgrade shall support loads imposed by vaults.

B. Precast Meter Vaults:

1. Install precast vaults in accordance with the manufacturer's recommendations. Set level on a minimum three inch (3 In) thick bed of sand conforming to requirements of Section 02140 Utility Backfill Materials.

2. Seal lifting holes with cement-sand mortar or non-shrink grout.

C. Meter Vault Floor Slab:

1. Construct floor slabs of six inch (6 In) thick reinforced concrete. Slope floor one-quarter inch per foot (1/4 in/ft) toward sump. Make sump twelve inches (12 In) in diameter or twelve inches (12 In) square and four inches (4 In) deep, unless other dimensions are required by the Drawings. Install dowels at maximum of eighteen inches (18 In), center-to-center for keying walls to floor slab.

2. Precast floor slab elements may be used for precast vault construction

D. Cast-in-Place Meter Vault Walls:

1. Key walls to floor slab and form to dimensions shown on the Drawings. Minimum wall thickness shall be four inches (4 In).

2. Cast walls monolithically: One (1) cold joint shall be allowed when vault depth exceeds twelve feet (12 ft).

3. Set frame for cover in concrete.

3.5 FRAME AND COVER FOR METER VAULTS

A. Set cast iron frame in a mortar bed and adjust elevation of cover as follows:

1. In unpaved areas, set top of meter box or meter vault cover two inches (2 In) to three inches (3 In) above natural grade.

2. In paved areas, set top of meter box or meter vault cover flush with adjacent concrete but no higher than one-half inch (1/2 In).

3.6 BACKFILL

A. Provide bank run sand in accordance with Section 02140 Utility Backfill Materials and backfill and compact in accordance with Section 02125 Excavation and Backfill for Utilities.

B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope one to five (1:5) slope from top to natural grade.

C. In paved areas, slope concrete down from meter box or vault to meet adjacent paved area.

END OF SECTION

SECTION 02445

CUT, PLUG AND ABANDONMENT OF WATERLINES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cut, plug and abandonment of water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for cut, plug and abandonment of water lines is on a unit price basis for each cut, plug and abandonment performed. Separate payment shall be made for each size of water line.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit product data for proposed plugs and clamps for approval.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02125 Excavation and Backfill for Utilities.

4. Section 02845- Pavement Repair and Resurfacing.

5. Section 03300 Structural Concrete.

PART II: PRODUCTS

2.1 MATERIALS

A. Concrete for reaction blocks: Class C conforming to requirements of Section 03300 Structural Concrete.

B. Plugs and clamps: Applicable for type of pipe to be plugged.

PART III: EXECUTION

3.1 APPLICATION

A. Do not begin cut, plug and abandonment operations until replacement water line has been constructed, disinfected, tested and service lines have been transferred to replacement water line.

B. Install plug, clamp and concrete reaction block and make cut at location shown on the Drawings.

C. Main to be abandoned shall not be valved off and shall not be cut or plugged other than at its supply water line or as shown on the Drawings.

D. After water line to be abandoned has been cut and plugged, check for other sources feeding abandoned water line. When sources are found, notify the Project Manager immediately. Cut and plug abandoned water line at point of other feed as directed by the Project Manager.

E. Plug or cap ends or openings in abandoned water line in manner approved by the Project Manager.

F. Remove and dispose of surface identifications such as valve boxes and fire hydrants. Valve boxes in improved streets, other than shell, may be filled with concrete after removing cap.

G. Backfill excavations in accordance with Section 02125 Excavation and Backfill for Utilities.

H. Repair street surfaces in accordance with Section 02845 Pavement Repair and Resurfacing.

END OF SECTION

SECTION 02450

HYDROSTATIC TESTING OF WATERLINES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Field hydrostatic testing of newly installed water waterlines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for hydrostatic testing of waterlines under this Section. Include cost in the unit price of waterlines being tested.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01140 □ Work Restrictions

2. Section 01270 □ Measurement and Payment.

3. Section 02455 □ Disinfection of Waterlines.

PART II: PRODUCTS □ NOT USED

PART III: EXECUTION

3.1 PREPARATION

A. Disinfect water system waterlines prior to hydrostatic testing.

B. Hydrostatically test newly installed water waterlines after disinfection, when required and before connecting to the City water distribution system.

C. Water for testing shall be at no cost to the Contractor in accordance with the City Ordinances. Prior to hydrostatic testing, obtain a transient meter from the City. A deposit is required for transient meter.

D. Test waterlines in lengths between valves or plugs, of not more than four thousand feet (4000 Ft).

E. Conduct hydrostatic tests in presence of the Project Manager.

3.2 TEST PROCEDURES

A. Furnish, install and operate connections, pump, meter and gages necessary for hydrostatic testing.

B. Allow pipeline to sit a minimum of twenty-four hours (24 Hrs) from time it is initially disinfected until testing begins, to allow pipe wall or lining material to absorb water. Periods of up to seven days (7 D) may be required for mortar lining to become saturated.

C. Expel air from all waterlines and apply a minimum test pressure of one hundred fifty pounds per square inch (150 psi) for a minimum of four hours (4 Hrs).

1. Fire line Testing is required to be two hundred pounds per square inch (200 psi) for a minimum of two hours (2 Hrs).

D. Begin pressure test by 9:00 a.m. unless otherwise approved by the Project Manager. Maintain test pressure for required amount of time. When large quantity of water is required to maintain pressure during test, discontinue testing until cause of water loss is identified and corrected.

1. At no time shall a hydrostatic test start after 1:00 P.M.

E. Keep valves inside pressure reducing stations closed during hydrostatic pressure test.

3.3 ALLOWABLE LEAKAGE FOR WATERLINES

A. During hydrostatic tests, no leakage shall be allowed for sections of water lines consisting of welded joints.

B. Maximum allowable leakage for water lines with rubber gasketed joints: Three and nineteen-hundredths gallons (3.19 Gal) per inch nominal diameter per mile of pipe per twenty-four hours (24 Hrs) while testing.

1. The following formula shall be used, either manually or electronically, for the amount of leakage:

$$L = \frac{NDP^{1/2}}{7400}$$

where: L = Allowable leakage, gallons per hour (Gal/Hr)
N = Number of joints in the length of the pipe
D = Nominal diameter of the pipe, in inches (In)
P = Average test pressure during the leakage test, pounds per square inch (psi)

C. For meter run installation, when work cannot be isolated and line fails pressure test, visual inspection of work by the Project Manager for leakage during pressure test may be used to fulfill requirements of this Section.

3.4 CORRECTION FOR FAILED TESTS

A. Repair joints showing visible leaks on surface regardless of total leakage shown on test. Check valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove cracked or defective pipes, fittings and valves discovered during pressure test and replace with new items.

B. The Project Manager shall require failed lines to be disinfected after repair and prior to retesting. Conduct and pay for subsequent disinfection operations in accordance with requirements of Section 02455 Disinfection of Waterlines. Pay for water required for additional disinfection and retesting.

C. After the second (2nd) failed test;

1. For City Projects, the Project Manager shall deduct the amounts of money from the Contract as stated in Section 01140 Work Restrictions for each additional test taken.

2. For Private Development, the Contractor shall pay the City the amount stated in Section 01140 Work Restrictions for each additional test, before the test is taken.

C. Repeat test until satisfactory results are obtained.

3.5 COMPLETION

A. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing and backfill excavation promptly.

END OF SECTION

SECTION 02455

DISINFECTION OF WATERLINES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Disinfection of potable water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for disinfection of water lines under this Section. Include cost in the unit price of water lines being disinfected.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Payment for Testing and Retesting.

1. Subsequent disinfection operations which may be necessary due to nonconforming or incomplete construction shall be charged to the Contractor for each additional Bacterial Test.

2. Charge shall consist of base charge of eighteen dollars ($18.00) per sample.

C. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA □ American Water Works Association.

1. AWWA C651 □ Standard for Disinfecting Water Mains

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

C. TCEQ Texas Commission on Environmental Quality

1. TCEQ Approved Disinfection Methods and Products.

PART II: PRODUCTS NOT USED

PART III: EXECUTION

3.1 CONDUCTING DISINFECTION

A. Promptly disinfect water lines constructed before tests are conducted on water lines and before water lines are connected to the City water distribution system.

B. Water for disinfection and flushing shall be furnished by the City without charge.

C. Unless otherwise provided in the Contract Documents, the Contractor shall be responsible for disinfection of water lines.

D. Coordinate chlorination operations through the Project Manager. A minimum of forty-eight hours (48 Hrs) notice shall be given.

3.2 PREPARATION

A. Provide temporary blind flanges, cast-iron sleeves, plugs, necessary service taps, copper service leads, risers and jumpers of sizes, location and materials and other items needed to facilitate disinfection of new water lines prior to connection to the City water distribution system. Normally, each valved section of water line requires two (2) each three-quarter inch (3/4 In) taps. A two inch (2 In) minimum blow-off is required for water lines up to and including six inch (6 In) diameter.

B. Use fire hydrants as blow-offs to flush newly constructed water lines eight inch (8 In) diameters and above. Where fire hydrants are not available on newly constructed water lines, install temporary blow-off valves and remove promptly upon successful completion of disinfection and testing.

C. Slowly fill each section of pipe with water in manner approved by the Project Manager. Average water velocity when filling pipeline should be less than one foot per second (1 ft/sec) and shall not, under any circumstance, exceed two feet per second (2 ft/sec). Before beginning disinfection operations, expel air from pipeline.

D. Backfill excavations immediately after installation of risers or blow-offs.

E. Install blow-off valves at end of water line to facilitate flushing of dead-end water lines. Install permanent blow-off valves according to the Drawings.

3.3 DISINFECTION BY THE CONTRACTOR

A. The following procedure shall be used when disinfection by the Contractor is required by the Contract Documents:

1. Use not less than one hundred parts of chlorine (100 CL) per million parts of water (1,000,000 H_2O).

2. Introduce chlorinating material to water lines in accordance with AWWA C651.

3. After contact period of not less than twenty-four hours (24 Hrs), flush system with clean water until residual chlorine is no less than one part of chlorine (1.0 CL) per million parts of water (1,000,000 H_2O) nor greater than four parts chlorine (4.0 CL) per million parts of water (1,000,000 H_2O).

4. Open and close valves in lines being sterilized several times during contact period.

5. If chemical compound is used for sterilizing agent, place in pipes as directed by the Project Manager.

3.4 BACTERIOLOGICAL TESTING

A. After disinfection and flushing of water lines, bacteriological tests shall be performed by the City at 10:00 A.M. Tuesdays and Thursdays. The Project Manager shall need to be informed of prospective testing forty-eight hours (48 Hrs) before these times, no exceptions.

B. The Project Manager shall determine the quantity of tests that shall need to be taken and the location of each test.

C. If the entire water line is being chlorinated and the bacteriological testing is being taken without isolating various parts of the water line and one (1) Bac-T fails, then all are deemed to have failed and new tests shall be taken on the entire line.

When isolating parts of the line for Bac-T testing, no isolated part of the

line shall be opened to the existing City utilities until the Bac-T has passed.

There shall be no Bac-T taken on any isolated section of line where the previous isolated section of line has either not passed or not been tested.

D. After two (2) failed sets of tests, line shall be re-chlorinated and flushed before any further tests can be taken. Additional disinfection of water lines based upon Texas Commission on Environmental Quality (TCEQ) requirements, the Contractor is responsible for additional disinfection operations.

3.5 COMPLETION

A. Upon completion of disinfection and testing, and after passing test results have been received in writing, remove risers except those approved for use in subsequent hydrostatic testing and backfill excavation promptly.

END OF SECTION

SECTION 02460

WET CONNECTIONS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Wet connections for new water lines and service lines to existing water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for wet connections shown on the Drawings is on a unit price basis for each wet connection. Separate payment shall be made for each size of water line.

2. No compensation shall be given for extra work or for damages occurring as result of incomplete shutoff.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum).

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA American Water Works Association.

1. AWWA C800 Standard for Underground Service Line Valves and Fittings.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Piping Sections 02200 through 02285.

3. Section 02410 Gate Valves.

4. Section 02430 Water Tap and Service Line Installation.

1.4 DEFINITIONS

A. Wet connections consist of isolating sections of pipe to be connected with existing valves, draining isolated sections and completing connections.

B. Connection of two inch (2 In) or smaller lines, which may be referred to on the Drawings as "two inch (2 In) standard connections" or "gooseneck connections" shall be measured as two inch (2 In) wet connections. This item is not to be used as part of two (2) inch service line.

PART II: PRODUCTS

2.1 MATERIALS

A. Pipe shall conform to requirements of applicable portions of Sections 02200 through 02285 related to piping materials and to water distribution.

B. Corporation cocks and saddles shall conform to requirements of Section 02430 Water Tap and Service Line Installation.

C. Valves shall conform to requirements of Section 02410 Gate Valves.

D. Brass fittings shall conform to requirements of AWWA C800.

PART III: EXECUTION

3.1 CONNECTION OPERATIONS

A. Plan wet connections in manner and at hours with least inconvenience public. Notify the Project Manager at least seventy-two hours (72 Hrs) in advance of making connections.

B. Do not operate valves on water lines in use by the City. The City of Friendswood Public Works Department shall handle, at no cost to the Contractor, operations involving opening and closing valves for wet connections.

C. Conduct connection operations when the Project Manager is at job site. Connection work shall progress without interruption until complete once existing water lines have been cut or plugs have been removed for

making connections.

3.2 TWO INCH (2 IN) WET CONNECTIONS

A. Tap water line: Use corporation cocks, saddles, copper tubing as required for line and grade adjustment and brass fittings necessary to adapt to existing water line. Use two inch (2 In) valves when indicated on the Drawings for two inch (2 In) copper gooseneck connections.

END OF SECTION

SECTION 02465

PROCEDURE FOR SAMPLING BACTERIOLOGICAL TESTS (BAC-T)

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Bacteriological Testing of potable water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for Bacteriological Testing of water lines under this Section. Include cost in the unit price of water lines being tested.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Payment for Testing and Retesting.

1. Subsequent disinfection operations which may be necessary due to nonconforming or incomplete construction shall be charged to the Contractor for each additional Bacteriological Test.

2. Charge shall consist of base charge of eighteen dollars ($18.00) per sample if the City is taking the samples. Checks are to be made payable to Eastex Environmental.

C. Stipulated Price (Lump Sum):

If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AWWA American Water Works Association.

AWWA C651 Standard for Disinfecting Water Mains.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 02450 Hydrostatic Testing of Waterlines.

3. Section 02455 Disinfection of Waterlines.

C. TCEQ Texas Commission on Environmental Quality

TCEQ Approved Disinfection Methods and Products.

PART II: PRODUCTS NOT USED

PART III: EXECUTION

3.1 UNDER NO CIRCUMSTANCES SHALL ANY PERSON, OTHER THAN AUTHORIZED CITY PERSONNEL, OPEN OR OPERATE ANY VALVE THAT IS CONNECTED TO AN EXISTING CITY SERVICE MAIN, BE IT A TAPPING SLEEVE AND VALVE (TS&V) MADE BY THE CONTRACTOR OR AN EXISTING STUB OUT.

3.2 CONDUCTING DISINFECTION

A. Promptly disinfect water lines constructed before tests are conducted on water lines and before water lines are connected to the City water distribution system.

B. Water for disinfection and flushing shall be furnished by the City without charge for the first two (2) sets of tests. If additional testing is needed, please refer to Section 3.4.E.

C. Unless otherwise provided in the Contract Documents, the Contractor shall be responsible for disinfection of water lines.

D. Coordinate chlorination operations through the Project Manager. A minimum of forty-eight hours (48 Hrs) notice shall be given.

E. Chlorination procedures for new lines shall be performed in accordance with City of Friendswood Technical Specification 02455 Disinfection of Waterlines.

3.3 SAMPLING STATIONS

A. Provide all necessary materials for Sampling Stations.

B. A Sampling Station shall be two inch (2 In) minimum blow-off with a half inch (1/2 In) Hose Bib.

C. Location Requirements:

1. One (1) Sampling Station is required for every One Thousand Two Hundred Feet (1,200 Ft) of waterline.

2. One (1) Sampling Station is required at the end of the line.

3. One (1) Sampling Station is required at every branch of the line longer than one (1) joint of pipe (20 feet).

D. Use of Fire Hydrants and blow-offs for Sampling of Bacteriological Tests shall not be allowed.

E. Service lead with a hose bib connection shall be allowable.

3.4 PROCEDURE FOR SAMPLE TAKING

A. After disinfection and flushing of water lines, Bacteriological Tests shall be performed by the City at 10:00 A.M. Tuesdays and Thursdays. The Project Manager shall need to be informed of prospective testing forty-eight hours (48 Hrs.) before these times, no exceptions.

B. Only authorized City Personnel shall operate the valves that attach the waterline being tested to the existing City Infrastructure, NO EXCEPTIONS.

C. The following procedure shall be used when sampling waterlines for Bacteriological Testing (BAC-T):

1. All water lines shall have been disinfected in accordance with City of Friendswood Specification 02455 □ Disinfection of Waterlines.

2. All water lines shall have been hydrostatically tested in accordance with City of Friendswood Specification 02450 □ Hydrostatic Testing of Waterlines.

3. Waterlines shall have been flushed fully flushing chlorinated water from the waterline until normal residual chlorine is

obtained at the end of the waterline.

4 Project Manager and Contractor identify and label the sampling locations.

5. If the Contractor is using another TCEQ accredited laboratory in lieu of the City's Laboratory, an authorized representative shall be onsite for chain of custody verification.

6. Test samples shall be taken in a sterile bottle treated with sodium thiosulfate, labeled for the location, and listed as Construction Sample.

7. Before opening the sampling location, coat with a disinfection solution of sodium hypochlorite from a spray bottle on the inside and outside of the hose bib.

8. Waterline is to sit for a minimum of sixteen hours (16 Hrs.) prior to samples being taken without flushing or in any way flowing the water in the line.

9. There shall be two (2) tests taken at each location. Collect one (1) sample at the location as soon as the hose bib is opened, and collect the second sample after fifteen minutes (15 Mins.) of the hose bib running.

10. Test results should be available within three days (3 Dys.) and shall be in written form only for acceptance. Verbal approval or disapproval is non-binding for testing purposes.

11. Any one (1) test that fails is a fail of all tests being taken, and the waterline that the tests represent.

D. After two (2) failed sets of tests, the line shall be re-chlorinated and flushed before any further tests can be taken. The Contractor shall be responsible for additional disinfection of water lines based upon Texas Commission on Environmental Quality (TCEQ) requirements.

E. **Cost of multiple re-testing will be charged at *$750.00 dollars per flushing point* for water usage and *$475.00 for labor costs* per set for each additional set of Bacteriological Tests taken.**

3.5 COMPLETION

Upon passing test results having been received in writing, the waterline will be put in service as part of the City's Infrastructure and no one but

an authorized City Employee shall be able to operate any valves attached to the new line.

END OF SECTION

SECTION 02500

GRAVITY SANITARY SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Gravity sanitary sewers and appurtenances, including stacks and service connections.

B. All connections to existing manholes shall be cored, no exceptions. Resilient connectors shall be supplied and used for all connections to manholes, new or existing.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for gravity sanitary sewers by open-cut or within Potentially Petroleum Contaminated Area (PPCA)is on a linear foot basis, complete in place, including sewer pipe, connections to existing manholes, post-installation television inspection and testing. Measurement shall be taken along centerline of pipe from centerline to centerline of manholes.

2. Payment for television inspection of existing gravity sanitary sewera shall be on a linear foot basis. Measurement shall be taken along centerline of pipe from centerline to centerline of manholes. See Section 02520 Television Inspection of Sanitary Sewer Lines.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit proposed methods, equipment, materials and sequence of

operations for sanitary sewer construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

C. Test Reports: Submit test reports and inspection videos as specified in Part III of this Section. DVD's become property of the City.

1.4 QUALITY ASSURANCE

A. Qualifications: Install sanitary sewer that is watertight both in pipe-to-pipe joints and in pipe-to-manhole connections. Perform testing in accordance with Section 02525 Acceptance Testing for Gravity Sanitary Sewers Lines.

B. Regulatory Requirements.

1. Install sanitary sewer lines to meet minimum separation distance from potable water line, as scheduled below. Separation distance is defined as the distance between outside of water pipe and outside of sanitary sewer pipe. When possible, install new sanitary sewers no closer to water lines than nine feet (9 Ft) in all directions. Where this separation distance cannot be achieved, new sanitary sewers shall be installed as specified in this Section.

2. Make notification to the Project Manager when water lines are uncovered during sanitary sewer installation where the minimum separation distance cannot be maintained. The Project Manager shall prescribe the method to protect water lines from sanitary sewer lines.

3. Lay gravity sewer lines in straight alignment and grade.

1.5 PRODUCT DELIVERY, STORAGE and HANDLING

A. Inspect pipe and fittings upon arrival of materials at job site.

B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear or free fall. Do not drag pipe and fittings along ground. Do not roll pipe unrestrained from delivery trucks.

C. Use mechanical means to move or handle pipe. Employ acceptable clamps, rope or slings around outside barrel of pipe and fittings. Do not use hooks, bars or other devices in contact with interior surface of pipe to lift or move lined pipe.

1.6 REFERENCES

A. CTFS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 01555 Traffic Control and Regulation.
4. Section 01585 Control of Ground and Surface Water.
5. Section 02105 Removing Existing Pavements and Structures.
6. Section 02125 Excavation and Backfill for Utilities.
7. Section 02140 Utility Backfill Materials.
8. Section 02145 Cement-Stabilized Sand.
9. Section 02215 Ductile Iron Pipe (DIP) and Fittings.
10. Section 02220 High Density Polyethylene Pipe (HDPE).
11. Section 02235 Polyvinyl Chloride Pipe (PVC).
12. Section 02280 Trench Safety Systems.
13. Section 02300 Cast-in-Place Concrete Manholes.
14. Section 02305 Precast Concrete Manholes.
15. Section 02315 Frames, Grates, Rings and Covers.
16. Section 02505 Sanitary Sewer Service Stub-outs or Reconnections.
17. Section 02520 Television Inspection of Sanitary Sewer Lines.
18. Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.
19. Section 02530 Sanitary Sewer Line Cleaning.
20. Section 02845 Pavement Repair and Resurfacing.

21. Section 02905 □ Topsoil.

22. Section 02910 □ Hydromulch Seeding.

23. Section 02915 □ Sodding.

PART II: PRODUCTS

2.1 PIPE

A. Provide piping materials for gravity sanitary sewers of sizes and types indicated on the Drawings or as specified.

B. Unlined reinforced concrete pipe shall not be used for gravity sanitary sewer.

2.2 PIPE MATERIAL SCHEDULE

A. Unless otherwise shown on the Drawings, use pipe materials that conform to requirements specified in one (1) or more of following Sections:

1. Section 02215 □ Ductile Iron Pipe (DIP) and Fittings.

2. Section 02220 □ High Density Polyethylene Pipe (HDPE).

3. Section 02235 □ Polyvinyl Chloride Pipe (PVC).

B. Where shown on the Drawings, provide pipe meeting minimum class, dimension ratio or other criteria indicated.

C. Pipe materials other than those listed above shall not be used for gravity sanitary sewers.

2.3 APPURTENANCES

A. Stacks: Conform to requirements of Section 02505 □ Sanitary Sewer Service Stub-outs or Reconnections.

B. Service Connections: Conform to requirements of Section 02505 □ Sanitary Sewer Service Stub-outs or Reconnections.

C. Roof, street or other type of surface water drains shall not be connected or reconnected into sanitary sewer lines.

2.4 BEDDING, BACKFILL and TOPSOIL MATERIAL

A. Bedding and Backfill: Conform to requirements of Section 02125 Excavation and Backfill for Utilities, Section 02140 Utility Backfill Materials and Section 02145 Cement-Stabilized Sand.

B. Topsoil: Conform to requirements of Section 02905 Topsoil.

PART III: EXECUTION

3.1 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction shall affect traffic. Conform to requirements of Section 01555 Traffic Control and Regulation.

B. Provide barricades, flashing warning lights and warning signs for excavations. Conform to requirements of Section 01555 Traffic Control and Regulation. Maintain barricades and warning lights where work is in progress or where traffic is affected by work.

C. Perform the Work in accordance with OSHA standards. Employ trench safety system as specified in Section 02280 Trench Safety System for excavations over five feet (5 Ft) deep.

D. Immediately notify agency or company owning any utility line which is damaged, broken or disturbed. Obtain approval from the Project Manager and agency or utility company for repairs or relocations, either temporary or permanent.

E. Remove old pavements and structures including sidewalks and driveways in accordance with requirements of Section 02105 Removing Existing Pavements and Structures.

F. Install and operate dewatering and surface water control measures in accordance with Section 01585 Control of Ground and Surface Water.

G. Do not allow sand, debris or runoff to enter sanitary sewer system.

3.2 DIVERSION PUMPING

A. Install and operate required bulkheads, plugs, piping and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and

procedures from the Project Manager.

B. Design piping, joints and accessories to withstand twice the maximum system pressure or fifty pounds per square inch (50 psi), whichever is greater.

C. No sewage shall be diverted into area outside of sanitary sewer.

D. In event of accidental spill or overflow, immediately stop overflow and take action to clean up and disinfect spillage. Promptly notify the Project Manager so that required reporting can be made to Texas Commission on Environmental Quality (TCEQ) by the Project Manager or the City.

3.3 EXCAVATION

A. Earthwork: Conform to requirements of Section 02125 Excavation and Backfill for Utilities. Use bedding as indicated on the Drawings.

B. Line and Grade: Establish required uniform line and grade in trench from benchmarks identified by the Project Manager. Maintain this control for minimum of one hundred feet (100 Ft) behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of the Work. Use of appropriately sized grade boards which are substantially supported is also acceptable. Protect boards and location stakes from damage or dislocation.

C. Trench Excavation: Excavate pipe trenches to depths shown on the Drawings and as specified in Section 02125 Excavation and Backfill for Utilities.

3.4 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed and trench has been approved by the Project Manager.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Install pipe with spigot ends toward the downstream end of flow such

that water flows out of the spigot and into the bell.

E. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

F. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe.

G. Provide lubricant, place and drive home newly laid sections of pipe with come-along winches so as to eliminate damage to pipe. Install pipe to "home" mark where provided. Use of backhoes or similar powered equipment shall not be allowed unless protective measures are provided and approved in advance by the Project Manager.

H. Keep excavations free of water during construction and until final inspection.

I. When the Work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

J. Where gravity sanitary sewer is to be installed under existing water line with separation distance of at least two feet (2 Ft) and less than nine feet (9 Ft), install new sanitary sewer pipe so that one (1) full eighteen foot (18 Ft) long pipe is centered on water line crossing. Embed sanitary sewer pipe in cement stabilized sand for minimum distance of nine feet (9 Ft) on each side of crossing.

K. Where gravity sanitary sewer is to be installed under existing water line with separation distance of less than two feet (2 Ft), install new sanitary sewer using pressure-rated pipe as shown on the Drawings. Maintain minimum six inch (6 In) separation distance. Embed sanitary sewer pipe in cement stabilized sand for minimum distance of nine feet (9 Ft) on each side of crossing.

L. Where the length of a stub-out is not indicated, install the stub-out to the right-of-way line and seal the free end with an approved plug. If stub-out is perpendicular to the right-of-way line then install pipe to the right-of-way-line.

M. At no time shall any pipe be dropped into the trench or from a height great than twelve inches (12 In). Should a pipe be dropped as noted, the pipe shall be removed and marked with an X as defective.

3.5 PIPE INSTALLATION OTHER THAN OPEN CUT

A. For installation of pipe by augering, jacking or tunneling, conform to

requirements of specification sections on tunneling augering, jacking and microtunneling work as appropriate.

3.6 INSTALLATION OF APPURTENANCES

A. Service Connections: Install service connections to conform to requirements of Section 2505 Sanitary Sewer Service Stub-outs or Reconnections.

B. Stacks: Construct stacks to conform to requirements of 02505 Sanitary Sewer Service Stub-outs or Reconnections.

C. Construct sanitary sewer manholes to conform to requirements of Section 02300 Cast-in-Place Concrete Manholes and Section 02305 Precast Concrete Manholes, as applicable. Install frames, rings and covers to conform to requirements of Section 02315 Frames, Grates, Rings and Covers.

3.7 INSPECTION AND TESTING

A. Visual Inspection: Check pipe alignment in accordance with Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.

B. Mandrel Testing: Use Mandrel Test to test flexible pipe for deflection. Refer to Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.

C. Pipe Leakage Test: After backfilling line segment and prior to tie-in of service connections, visually inspect gravity sanitary sewers where feasible and test for leakage in accordance with Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines. Maintain piezometer installed to conform with Section 01585 Control of Ground and Surface Water, until acceptance testing is completed.

3.8 BACKFILL AND SITE CLEANUP

A. Backfill and compact soil in accordance with Section 02125 Excavation and Backfill for Utilities.

B. Backfill trench in specified lifts only after pipe installation is approved by the Project Manager.

C. Repair and replace removed or damaged pavement, curbs, gutters and sidewalks as specified in Section 02845 Pavement Repair and Resurfacing.

D. Provide hydromulch seeding in areas of commercial, industrial or undeveloped land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on the Drawings. Provide minimum of four inches (4 In) of topsoil as specified in Section 02905 Topsoil and apply hydromulch according to requirements of Section 02910 Hydromulch Seeding.

E. Provide sodding in areas of residential land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on the Drawings. Provide minimum of four inches (4 In) of topsoil per Section 02905 Topsoil. Sod disturbed areas in accordance with Section 02915 Sodding.

3.9 POST-INSTALLATION TELEVISION INSPECTION

A. Prior to final acceptance of newly constructed gravity sanitary sewers, perform cleaning and closed circuit television inspection.

1. Cleaning of sanitary sewer lines and manholes shall conform to Section 02530 Sanitary Sewer Line Cleaning.

2. Television inspection shall be performed after sanitary sewer line has been cleaned. Television inspection shall conform to Section 02520 Television Inspection of Sanitary Sewer Lines.

B. Upon completion of television inspection reviews by the Project Manager, the Contractor shall be notified regarding final acceptance of sanitary sewer segment.

END OF SECTION

SECTION 02520

TELEVISION INSPECTION OF SANITARY SEWER LINES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Post-installation television inspection.

B. Existing installation television inspection.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No payment will be made for cleaning and television inspection of new gravity sanitary sewer lines under this Section. Include payment in unit price for work requiring cleaning and television inspection.

2. Payment for television inspection of existing gravity sanitary sewer will be on a linear foot basis. Measurement will be taken along centerline of pipe from centerline to centerline of manholes.

3. Payment shall be full compensation for all material, equipment and labor required for complete abandonment grouting, including air venting, testing, temporary plugs, PVC pipes and incidentals.

4. No separate payment shall be made for television inspection that is required in Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.

5. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Standards.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02525 Acceptance Testing for Gravity Sanitary Sewer Lines.

4. Section 02530 Sanitary Sewer Line Cleaning.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. The Contractor shall submit the following:

1. Manufacturers brochures and specifications for TV equipment.

2. Recording media shall be DVD.

3. Test report and project summary.

PART II: PRODUCTS

2.1 RECORDING DEVICE

A. Recording device shall be high quality color recording device capable of recording DVD's.

B. The following information shall be available as follows:

1. Each DVD media shall be permanently labeled with the following information:

a. Project Name

b. Project Number

c. Manhole to Manhole Designation

d. Name of the Contractor

e. Date Televised

2. The following information shall be recorded and visible on screen for ten seconds (10 Sec) immediately before the start of televising each line segment:

   a. Project Name

   b. Project Number

   c. Upstream Manhole Designation

   d. Downstream Manhole Designation

   e. Pipe Material

   f. Pipe Size

   g. Name of the Contractor

   h. Date Televised

   i. Street and/or Easement Location

3. A continuous uninterrupted recording of distance from the insertion manhole shall be visible at the lower left corner of the screen at all times during inspection.

4. The following information shall be provided in a hard copy report to accompany each DVD media:

   a. Project Name

   b. Project Number

   c. Name of the Contractor

   d. Date Televised

   e. Street and/or Easement Location

   f. Upstream Manhole Designation

   g. Downstream Manhole Designation

   h. Pipe Material

i. Pipe Diameter

j. Location of Service Connections

C. When the reports and DVD media are complete they shall be given to the Project Manager. DVD media and reports shall become the property of the City of Friendswood.

2.2 CLOSED CIRCUIT TELEVISION CAMERA

A. Television inspection cameras shall be required to adhere to the following specifications:

1. Camera must be equipped with rotating head capable of ninety degree (90°) rotation from horizontal and three hundred sixty degree (360°) rotation about its centerline.

2. Minimum Camera Resolution: Four Hundred (400) vertical lines and four hundred sixty (460) horizontal lines.

3. Camera Lens: Not less than two hundred seventy-five degree (275°) viewing angle with automatic or remote focus and iris controls.

4. Focal Distance: Adjustable through range of six inches (6 In) to infinity.

5. Camera shall be intrinsically safe and operative in one hundred percent (100%) humidity conditions.

6. Lighting Intensity: Remote controlled and adjusted to minimize reflective glare.

7. Lighting and Camera Quality: Provide clear in-focus picture of the entire inside periphery of line being televised.

8. Camera must have height adjustment so that the camera lens is always centered at one-half (1/2) the diameter of the pipe.

B. Footage Counter: Camera shall have an accurate footage counter which displays on the monitor the exact distance from the starting manhole.

C. Camera shall be self-propelled.

PART III: EXECUTION

3.1 PREPARATION

A. Pipes to be inspected shall be cleaned as specified in Section 02530 Sanitary Sewer Line Cleaning. Pipes shall be televised immediately following the cleaning of the pipes done in accordance with Section 02530 Sanitary Sewer Line Cleaning.

B. If the depth of flow exceeds the specifications listed in TABLE 4.1 MAXIMUM DEPTH OF FLOW in this Section, then bypass pumping shall be required at no additional cost to the City.

C. Move camera through the pipe from upstream manhole to downstream manhole stopping when necessary to permit proper documentation of pipe conditions. Upon entrance and exit of manholes, the camera shall pan to demonstrate that debris has been removed. At no time shall the camera be pulled at a rate faster than thirty feet per minute (30 Ft/Min). Use manual winches, power winches, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with the documentation of pipe conditions to move the camera through the pipe. **Under no circumstances shall the camera be tethered to a hydraulically propelled or high-velocity jet cleaning device while the cleaning device is on.**

D. If the television camera will not pass through an entire section, set up equipment so that inspection can be performed from the opposite manhole. If the camera still cannot pass through the section, then the obstruction shall be cleared by cleaning, removal or point repair as directed by the Project Manager at no additional cost to the City and reinspected.

E. Measurement for location of defects shall be aboveground by means of a meter device. Marking the cable, or similar method, which would require the interpolation of the depth of the manhole shall not be allowed. Check accuracy of the distance meter by use of a walking meter, roll-a-tape or other suitable device. The accuracy shall be satisfactory to the Project Manager.

F. The camera image shall be down the center axis of the pipe when the camera is in motion. The contractor is required to provide a three hundred sixty degree (360°) radial view of the pipe interior using a camera with pan and tilt capabilities for eight inch (8 In) diameter pipe and larger.

G. Points of interest shall also be digitally recorded and shall include, but not limited to, defective joints, ovality, debris, sediments, cracked pipes, holes, blockages, bellies and service connections.

3.2 DOCUMENTATION AND REPORTING

A. Television Inspection Logs: Develop and keep printed location records that clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition record any other points of significance or concern and other discernible features.

B. Photographs: Take digital photographs or digital DVD stills of any defect or points of interest recorded on the inspection report.

C. Each report on each segment shall use the Television Inspection Codes in Tables 4.2 to 4.12. The final report shall also give a total value of the section pipe that has been inspected.

D. Provide the City with two (2) copies of each DVD and two (2) copies of each report.

E. The Project Manager shall review the DVD media and documentation to ensure compliance listed in this specification.

PART IV: TABLES

4.1 MAXIMUM DEPTH OF FLOW

Nominal Pipe Diameter	Maximum Depth of Flow
6 to 10	1 inch
12 to 14	2 inches
15 to 24	3 inches
Over 24	4 inches

4.2 TELEVISION INSPECTION CODES □LOCATION

LOCATION	CODE
Alley, Good Access	A
Alley, Poor Access	B
Easement, Good Access	C
Easement, Poor Access	D
Open Area, Good Access	E
Open Area, Poor Access	F
Parking Lot, Good Access	G
Parking Lot, Poor Access	H
ROW, Light Traffic	I
ROW, Medium Traffic	J
ROW, Heavy Traffic	K
Street, Light Traffic	L
Street, Medium Traffic	M
Street, Heavy Traffic	N

4.3 TELEVISION INSPECTION CODES □SURFACE COVER

SURFACE COVER	CODE
Asphalt Street	A
Concrete Street	B
Sidewalk	C
Trees/Shrubs	D
Close to Fence	E
Open Area	F
Moveable Structure	G
Unmovable Structure	H
Overhead Utilities	I
Pipe Above Ground	J

4.4 TELEVISION INSPECTION CODES □ PIPE TYPE

SURFACE COVER	CODE
Cast Iron Pipe	CIP
Corrugated Metal Pipe	CMP
Concrete Pipe Poured in Place	CON
Cured in Place Pipe	CPP
Ductile Iron Pipe	DIP
Fiberglass Reinforced Pipe	FRP
High Density Polyethylene Pipe	HDP
Plastic Lined Concrete Pipe	PLP
Polyvinylchloride Pipe	PVC
Reinforced Concrete Pipe	RCP
Vitrified Clay Pipe	VCP

4.5 TELEVISION INSPECTION CODES □ ALIGNMENT

Description	CODE
Begin 1/4 Pipe of Water	A
Begin 1/2 Pipe of Water	B
Begin Camera Underwater	C
End Camera Underwater	D
End 1/2 Pipe of Water	E
End 1/4 Pipe of Water	F

4.6 TELEVISION INSPECTION CODES □CRACKS

DESCRIPTION[1]	CODE	VALUE
< 1/2" W, < 1/2' L	A	1
< 1/2" W, < 1' □2' L	B	2
< 1/2" W, > 2' L	C	3
> 1/2" W, < 1/2' L	D	4
> 1/2" W, < 1' □2' L	E	5
> 1/2" W, > 2' L	F	6
Hole in Pipe □Small	G	7
Pipe Missing < 60°	H	8
Pipe Missing > 60°	I	9

[1]Use prefix of RC for Radial Cracks and LC for Longitudinal cracks.

4.7 TELEVISION INSPECTION CODES □JOINTS

DESCRIPTION	CODE	VALUE
Dropped Joint > 90% Clear	A	3
Dropped Joint 80% □90% Clear	B	6
Dropped Joint < 80% Clear	C	9
Shifted Joint > 90% Clear	D	3
Shifted Joint 80% □90% Clear	E	6
Shifted < 80% Clear	F	9
Withdrawn Joint 2□□3□	G	1
Withdrawn Joint 3□□4□	H	2
Withdrawn Joint > 4□	I	3
Visible Gasket	J	0
Leaking at Joint	K	0
Broken Joint □Light	L	2
Broken Joint □Medium	M	4
Broken Joint □Heavy	N	6

4.8 TELEVISION INSPECTION CODES - LATERALS

DESCRIPTION	CODE	VALUE
Private Service 0□□1□	A	1
Private Service 1□□2□	B	2
Private Service 2□□3□	C	3
Private Service 3□□4□	D	4
Private Service 0 > 4□	E	5
Defective Service Connection	F	6
Dead/Unused Service	G	7
Factory Service	H	8
Plumber Service	I	0

4.9 TELEVISION INSPECTION CODES - ROOTS

DESCRIPTION	CODE	VALUE
Roots, Light	A	1
Roots, Medium	B	2
Roots, Heavy	C	3

4.10 TELEVISION INSPECTION CODES - DEBRIS

DESCRIPTION	CODE	VALUE
Debris, Light	A	1
Debris, Medium	B	2
Debris, Heavy	C	3
Grease, Light	D	4
Greasy, Medium	E	5
Grease, Heavy	F	6

4.11 TELEVISION INSPECTION CODES □ INFLOW/INFILTRATION

DESCRIPTION	CODE	VALUE
I/I □ Light (0-1 GPM)	A	3
I/I □ Medium (1-5 GPM)	B	6
I/I □ Heavy (>5 GPM)	C	9
I/I □ Some Evidence	D	2
I/I □ Considerable Evidence	E	4
I/I □ Great Evidence	F	6
I/I □ No Evidence	G	0

4.12 TELEVISION INSPECTION CODES □ STRUCTURAL

DESCRIPTION	CODE	VALUE
Line Deterioration, Light	A	3
Line Deterioration, Medium	B	6
Line Deterioration, Heavy	C	9
Line Deterioration, None	D	0
Oval < 5%	E	3
Oval > 5% and <10%	F	6
Oval > 10%	G	9
Collapsed	H	9
Pipe Deterioration, Light	I	0
Pipe Deterioration, Medium	J	0
Pipe Deterioration, Heavy	K	0
Pipe Deterioration, None	L	0
At Manhole	M	0

END OF SECTION

SECTION 02525

ACCEPTANCE TESTING FOR GRAVITY SANITARY SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Acceptance testing of sanitary sewers including:

1. Visual inspection of sewer pipes.
2. Mandrel testing for flexible sewer pipes.
3. Leakage testing of sewer pipes.
4. Leakage testing of manholes.
5. Smoke testing of point repairs.
6. Cleaning of Sanitary Sewer Systems.
7. Television inspection of sewer pipes.

B. All tests listed in this Section are not necessarily required on this Project. Required tests are named in other Sections which refer to this Section for testing criteria and procedures.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for acceptance testing under this Section. Include payment in the unit price for work requiring acceptance testing.
2. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

2. ASTM D3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

3. ASTM F794 - Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

4. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01585 Control of Ground and Surface Water.

4. Section 02520 Television Inspection of Sanitary Sewer Lines.

1.4 GRAVITY SANITARY SEWER PERFORMANCE REQUIREMENTS

A. Gravity flow sanitary sewers are required to have straight alignment and uniform grade between manholes.

B. Flexible pipe, including "semi-rigid" pipe, is required to show no more than five percent (5%) deflection. Test pipe no sooner than thirty days (30 D) after backfilling of line segment but prior to final acceptance using standard mandrel to verify that installed pipe is within specified deflection tolerances.

C. Maximum allowable leakage for Infiltration or Exfiltration:

1. The total exfiltration, as determined by hydrostatic head test, shall not exceed fifty gallons (50 Gal) per inch diameter per mile of pipe per twenty-four hours (24 Hrs) at minimum test head of two feet (2 Ft) above crown of pipe at upstream manhole or two feet (2 Ft) above groundwater elevation,

whichever is greater.

2. When pipes are installed more than two feet (2 Ft) below groundwater level, use infiltration test in lieu of exfiltration test. Total infiltration shall not exceed fifty gallons (50 Gal) per inch diameter per mile of pipe per twenty-four hours (24 Hrs). Groundwater elevation must be at least two feet (2 Ft) above crown of pipe at upstream manhole.

3. Refer to TABLE 4.1 WATER TEST ALLOWABLE LEAKAGE in this Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.

D. Perform air testing in accordance with requirements of this Section and Texas Commission on Environmental Quality (TCEQ) requirements. Refer to TABLE 4.2 □ TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI and TABLE 4.3 MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST in this Section.

E. Perform vacuum testing of manholes in accordance with requirements of this Section and Texas Commission on Environmental Quality (TCEQ) requirements. Refer to TABLE 4.4 □ VACUUM TESTING TIME TABLE in this Section.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval by the Project Manager. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from the Drawings and the Specifications.

C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.

1.6 GRAVITY SANITARY SEWER QUALITY ASSURANCE

A. Repair, correct, and retest manholes or sections of pipe which fail to meet specified requirements when tested.

B. Provide testing reports and DVD media of television inspection as directed by the Project Manager and as specified in Section 02520 □ Television Inspection of Sanitary Sewer Lines.

C. Upon completion of DVD media reviews by the Project Manager, the Contractor shall be notified regarding final acceptance of the gravity sanitary sewer segment.

1.7 SEQUENCING AND SCHEDULING

A. Perform testing as work progresses. Schedule testing so that no more than one thousand linear feet (1000 Lf) of installed gravity sanitary sewer remains untested at one (1) time.

B. Coordinate testing schedules with the Project Manager. Perform testing under observation of the Project Manager.

PART II: PRODUCTS

2.1 DEFLECTION MANDREL

A. Mandrel Sizing: Rigid mandrel shall have outside diameter (O.D.) equal to ninety-five percent (95%) of inside diameter (I.D.) of pipe. Inside diameter of pipe, for purpose of determining outside diameter of mandrel, shall be average outside diameter minus two (2) minimum wall thicknesses for O.D. controlled pipe and average inside diameter for I.D. controlled pipe, dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

B. Mandrel Design: Rigid mandrel shall be constructed of metal or rigid plastic material that can withstand two hundred pounds per square inch (200 psi) without being deformed. Mandrel shall have nine (9) or more "runners" or "legs" as long as total number of legs is odd number. Barrel section of mandrel shall have length of at least seventy-five percent (75%) of inside diameter of pipe. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. Provide and use proving ring for verifying each size of mandrel.

C. Proving Ring: Furnish "proving ring" with each mandrel. Fabricate ring of one-half inch (1/2 In) thick, three inch (3 In) wide bar steel to diameter 0.02 inches larger than approved mandrel diameter.

D. Mandrel Dimensions [five percent (5%) allowance]: Average inside diameter and minimum mandrel diameter are specified in TABLE 4.5 □ PIPE VS. MANDREL DIAMETER in this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in table may be used when approved by the Project Manager.

2.2 EXFILTRATION TEST

A. Water Meter: Obtain transient water meter from the City for use when water for testing shall be taken from the City system. Conform to the City requirements for water meter use.

B. Test Equipment:

1. Pipe plugs.

2. Pipe risers where manhole cone is less than two feet (2 Ft) above highest point in pipe or service lead.

2.3 INFILTRATION TEST

A. Test Equipment:

1. Calibrated ninety degree (90°) V-notch weir.

2. Pipe plugs.

2.4 LOW PRESSURE AIR TEST

A. Minimum Requirement for Equipment:

1. Control panel.

2. Low-pressure air supply connected to control panel.

3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.

4. Air hoses from control panel to:

a. Air supply.

b. Pneumatic plugs.

c. Sealed line for pressuring.

d. Sealed line for monitoring internal pressure.

B. Testing Pneumatic Plugs: Place pneumatic plug in each end of length of pipe on ground. Pressurize plugs to a minimum of twenty-five

pounds per square inch (25 psi); then pressurize sealed pipe to five pounds per square inch (5 psi). Plugs are acceptable when they remain in place against test pressure without external aids.

2.5 GROUND WATER DETERMINATION

A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

2.6 SMOKE TESTING

A. Equipment:

1. Pneumatic plugs.

2. Smoke generator as supplied by Superior Signal Company, or approved equal.

3. Blowers producing two thousand five hundred Standard Cubic Feet per Minute (2500 Scfm) minimum.

PART III: E X E C U T I O N

3.1 PREPARATION

A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.

B. Determine selection of test methods and pressures for gravity sanitary sewers based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Section 01585 - Control of Ground and Surface Water.

3.2 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

A. Check pipe alignment visually by flashing light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and relay or replace pipe segment.

3.3 MANDREL TESTING FOR GRAVITY SANITARY SEWERS

A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than five percent (5%) deflection. Mandrel testing shall

conform to ASTM D3034. Perform testing no sooner than thirty days (30 D) after backfilling of line segment, but prior to final acceptance testing of line segment.

B. Pull approved mandrel by hand through gravity sanitary sewer sections. Replace any section of gravity sanitary sewer not passing mandrel. Mandrel testing is not required for stub-outs.

C. Retest repaired or replaced gravity sanitary sewer sections.

3.4 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS

A. Test Options:

1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.

2. Test new, replacement or rehabilitated gravity sanitary sewer manholes with water or low pressure air. Manholes tested with low pressure air shall undergo physical inspection prior to testing.

3. Perform leakage testing after backfilling of line segment, and prior to tie-in of service connections.

4. If no installed piezometer is within 500 feet of gravity sanitary sewer segment, provide temporary piezometer for this purpose.

B. Compensating for Ground Water Pressure:

1. Where ground water exists, install pipe nipple at same time gravity sanitary sewer line is placed. Use one-half inch (1/2 In) capped pipe nipple approximately ten inches (10 In) long. Make installation through manhole wall on top of gravity sanitary sewer line where line enters manhole.

2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect clear plastic tube to nipple. Support tube vertically and allow water to rise in tube. After water stops rising, measure height in feet of water over invert of pipe. Divide this height by two and three-tenths feet/pounds per square inch (2.3 Ft/psi) to determine ground water pressure to be used in line testing.

C. Exfiltration test:

1. Determine ground water elevation.

2. Plug sewer in downstream manhole.

3. Plug incoming pipes in upstream manhole.

4. Install riser pipe in outgoing pipe of upstream manhole when highest point in service lead (house service) is less than two feet (2 Ft) below bottom of manhole cone.

5. Fill gravity sanitary sewer pipe and manhole or pipe riser, when used, with water to point two and one-half feet (2-1/2 Ft) above highest point in gravity sanitary sewer pipe, house lead, or ground water table, whichever is highest.

6. Allow water to stabilize for one hour (1 Hr) to two hours (2 Hrs). Take water level reading to determine drop of water surface, in inches, over one hour (1 Hr) period, and calculate water loss [one inch (1 In) of water in four feet (4 Ft) diameter manhole equals eight and twenty-two hundredths gallons (8.22 Gal)] or measure quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to TABLE 4.1 WATER TEST ALLOWABLE LEAKAGE in this Section.

D. Infiltration test: Ground water elevation must be not less than two feet (2 Ft) above highest point of gravity sanitary sewer pipe or service lead (house service).

1. Determine ground water elevation.

2. Plug incoming pipes in upstream manhole.

3. Insert calibrated ninety degree (90°) V-notch weir in pipe on downstream manhole.

4. Allow water to rise and flow over weir until it stabilizes.

5. Take five (5) readings of accumulated volume over period of two hours (2 Hrs) and use average for infiltration. Average must not exceed that calculated for two hours (2 Hrs) from allowable leakage according to TABLE 4.1 WATER TEST ALLOWABLE LEAKAGE in this Section.

E. Low Air Pressure Test: When using this test conform to ASTM C924 or ASTM F1417, as applicable, with holding time not less than that listed in TABLE 4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI.

1. Air testing for sections of pipe shall be limited to lines less than thirty-six inch (36 In) average inside diameter.

2. Lines thirty-six inch (36 In) average inside diameter and larger shall be tested at each joint. Minimum time allowable for pressure to drop from five pounds per square inch (5.0 psi) to four pounds per square inch (4.0 psi) during joint test shall be ten seconds (10 Sec), regardless of pipe size.

3. For pipe sections less than thirty-six inch (36 In) average inside diameter:

a. Determine ground water level.

b. Plug both ends of pipe.

c. After manhole-to-manhole section of gravity sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.

d. Pressurize pipe to five pounds per square inch (5.0 psi). See TABLE 4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 TO 4.0 PSI in this Section.

e. To determine air loss, measure time interval for pressure to drop to four pounds per square inch (4.0 psi). Time must exceed that listed in TABLE 4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 TO 4.0 PSI in this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

F. Retest: Repair and retest any section of pipe which fails to meet requirements.

3.5 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to TABLE 4.1 WATER TEST ALLOWABLE LEAKAGE in this Section.

B. Low Pressure Air Test:

1. TABLE 4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 TO 4.0 PSI in this Section, are based on equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria 317.2(a)(4)(B).

$$T = 0.0850(D)(K)/(Q)$$

Where:
- T = time for pressure to drop one (1.0) pound per square inch gauge in seconds
- K = 0.000419 DL, but not less than one (1.0)
- D = average inside diameter in inches
- L = length of line of same size pipe
- Q = rate of loss, 0.0015 ft^3/min./sq. ft. internal surface

2. Since K value of less than one (1.0) shall not be used, there are minimum testing times for each pipe diameter as given in TABLE 4.3 MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST in this Section.

Notes:

1. When two (2) sizes of pipe are involved, compute time by ratio of lengths involved.

2. Lines with twenty-seven inch (27 In) average inside diameter and larger may be air tested at each joint.

3. Lines with average inside diameter greater than thirty-six inches (36 In) shall be air tested for leakage at each joint.

4. If joint test is used, perform visual inspection of joint immediately after testing.

5. For joint test, pipe is to be pressurized to four (4.0) psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from five (5.0) pounds per square inch to four (4.0) pounds per square inch shall be ten (10) seconds.

3.6 LEAKAGE TESTING FOR MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.

B. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs minimum of six inches (6 In) outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.

C. Vacuum testing:

1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.

2. Evacuate manhole with vacuum pump to ten inches (10 In) of mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table 4.3 VACUUM TESTING TIME TABLE in this Section.

3. If drop in vacuum exceeds one inch of mercury(1 In/Hg) over specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

D. Perform hydrostatic exfiltration testing as follows:

1. Seal wastewater lines coming into manhole with internal pipe plug. Then fill manhole with water and maintain it full for at least one hour (1 Hr).

2. The maximum leakage for hydrostatic testing shall be twenty-five thousandths gallons (0.025 Gal) per foot diameter per foot of manhole depth per hour.

3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

3.7 SMOKE TEST PROCEDURE FOR POINT REPAIRS

A. Application: Perform smoke test to:

1. Locate points of line failure for point repair.

2. Determine when point repairs are properly made.

3. Determine when service connections have been reconnected to rehabilitated sewer.

4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.

B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in single manhole-to-manhole section at one (1) time. Keep number of open excavations to minimum.

C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than two days (2 D), nor more than seven days (7 D), prior to proposed testing. Also give notice to the City of Friendswood Police, Fire Departments and Public Works twenty-four hours (24 Hrs) prior to actual smoke testing.

D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal annular space at manhole for sliplined sections.

E. Smoke Introduction:

1. Operate equipment according to manufacturer's recommendation and as approved by the Project Manager.

2. Conduct test by forcing smoke from smoke generators through gravity sanitary sewer main and service connections. Operate smoke generators for minimum of five minutes (5 Min).

3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor taps/connections for smoke leaks. Note sources of leaks.

F. Repair and Retest: Repair and replace taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one (1) manhole-to-manhole section at time. When repair or replacement, testing or retesting, and backfilling of excavation is not completed within one (1) work day, properly barricade and cover each excavation as approved by the Project Manager.

G. Service Connections: On houses where smoke does not escape from plumbing vent stacks to confirm reconnection of sewer service to newly installed liner pipe, perform dye test to confirm reconnection has been made. Introduce dye into service line through plumbing fixture inside

structure or sewer cleanout immediately outside structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms reconnection.

PART IV: TABLES

4.1 WATER TEST ALLOWABLE LEAKAGE

Diameter of Riser or Stack in Inches	Volume per Inch of Depth		Allowance Leakage*	
	Inch	Gallons	Pipe Size in Inches	Gal./Min. per 100 ft.
1	0.7854	0.0034	6	0.0039
2	3.1416	0.0136	8	0.0053
2.5	4.9087	0.0212	10	0.0066
3	7.0686	0.0306	12	0.0079
4	12.5664	0.0306	15	0.0099
5	19.6350	0.0544	18	0.0118
6	28.2743	0.1224	21	0.0138
8	50.2655	0.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1 diameter.			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours.	
* Allowable leakage rate shall be reduced to ten gallons (10 Gal) per inch of inside diameter per mile per twenty-four hours (24 Hrs)when sewer is identified as located above twenty-five year (25 Yr) flood plain.				

4.2 TIME ALLOWED FOR PRESSURE LOSS FROM 5.0 PSI TO 4.0 PSI

Pipe Dia. In.	Min. Time mm:ss	Length for Min. Time	Time for Longer Length	Specification Time for Length (L) shown in MM:SS				
				100'	150'	200'	250'	300'
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17

Pipe Dia. In.	Min. Time mm:ss	Length for Min. Time	Time for Longer Length	Specification Time for Length (L) shown in MM:SS					
				350'	400'	450'	500'	550'	600'
6	5:40	398	0.8548	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	8:52	10:08	11:24	12:08	13:56	15:12
10	9:27	239	2.3743	13:51	15:50	17:48	19:47	21:46	23:45
12	11:20	199	3.4190	19:57	22:48	25:39	28:30	31:20	34:11
15	14:10	159	5.3423	31:10	35:37	40:04	44:31	48:58	53:25
18	17:00	133	7.6928	44:52	51:17	57:42	64:06	70:31	76:56
21	19:50	114	10.4708	61:05	69:48	78:32	87:15	95:59	104:42
24	22:40	99	13.6762	79:47	91:10	102:34	113:58	125:22	136:46
27	25:30	88	17.3089	100:58	115:24	129:49	144:14	158:40	173:05
30	28:20	80	21.3690	124:39	142:28	160:16	178:05	195:53	213:41
33	31:10	72	25.8565	150:50	172:23	193:55	215:28	237:01	258:34

4.3 MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

Pipe Diameter (Inches)	Minimum Time (seconds)	Length of Pipe for Minimum Time (feet)	Time for Longer Length (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	99	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	258.856 (L)

4.4 □VACUUM TESTING TIME TABLE

TIME ALLOWED FOR VACUUM LOSS FROM 10.0 Hg TO 9.0 Hg			
	TIME IN SECONDS BY DIAMETER OF MANHOLES		
Manhole Depth in Feet	48□ Diameter	60□ Diameter	72□ Diameter
8' and less	14	18	23
10	17	23	28
12	21	28	34
14	25	32	40
16	28	37	45
18	23	41	51
20	35	46	57
22	39	51	62
24	42	55	68
26	46	60	74
28	49	64	80
30	53	69	85

4.5 □ PIPE VS. MANDREL DIAMETER

PIPE VERSUS MANDREL DIAMETER			
Material and Wall Construction	Nominal Size (Inches)	Average I.D. (Inches)	Minimum Mandrel Diameter (Inches)
PVC - Solid (SDR 26)6	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC □ Solid (SDR 35)12	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC □ Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC □ Profile (ASTM F794)	12	11.470	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
	48	47.500	45.125
HDPE □ Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
	60	60.000	57.00
Fiberglass (Class SN-46)	12	12.85	11.822
	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
	60	60.38	57.361

END OF SECTION

SECTION 02540

SANITARY SEWER POINT REPAIRS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Repair and replacement of sanitary sewer line failures.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for point repairs shall be on a unit price basis for each repair. Payment shall be made for each repair complete in place, including all materials equipment, labor and excavation and backfill.

2. Payment for point repairs shall be on a unit price basis per linear foot of repair as measured along the centerline of the sanitary sewer line. Payment shall be made for each repair complete in place, including all materials equipment, labor and excavation and backfill.

3. No separate payment shall be made for Television Inspection of repaired sanitary sewer lines.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If contract is Stipulated Price Contract, payment for work in this Section is included in the Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C150 Standard Specification for Portland Cement.

2. ASTM D698 Standard Test Methods for Laboratory Characteristics of Soil Using Standard Effort.

B. CFSD City of Friendswood Standard Details.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 01580 Waste Material Disposal.
4. Section 02125 Excavation and Back Fill for Utilities.
5. Section 02140 Utility Backfill Materials.
6. Section 02145 Cement-Stabilized Sand.
7. Section 02280 Trench Safety Systems.
8. Section 02555 Sanitary Sewer Bypass Pumping.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit product data for each pipe product, fitting, coupling and adapter.

1.5 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that pipes, fittings, couplings and adapters were manufactured in compliance with standards and Technical Specifications referenced in this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Use only soils that are in compliance with the specifications in Section 02140 Utility Backfill Materials.

B. Use cement-stabilized backfill for bedding and backfill to above the pipe as required. Repairs under paving shall have cement-stabilized backfill to the top of the subgrade of the paving that shall conform to Section 02145 Cement-Stabilized Sand.

1. Cement shall consist of Type I Portland Cement conforming to ASTM C150.

2. Sand and cement shall be mixed in a pug mill or obtained from an approved supplier using not less that one and one-half (1-1/2) sacks of cement per one ton (1 Tn) of mixture and sufficient water to hydrate the cement.

C. All pipe and materials for repair shall conform to the appropriate section, Section 02200 to Section 02280, for the type of pipe being repaired.

PART III: EXECUTION

3.1 PREPARATION

A. All line materials (pipe and fittings) shall be on-site prior to any excavation.

B. Bedding material shall be on-site or delivery arrangements definitely made with a reliable source.

C. Trench Safety Systems shall be on-site and shall comply with all rules, regulations and laws as specified in Section 02280 Trench Safety Systems.

D. Provide bypass pumping as required. Bypass pumping shall be incidental to the work in this Section. All bypass pumping shall conform to Section 02555 Sanitary Sewer Bypass Pumping.

3.2 EXCAVATION

A. Trenching and Excavations shall comply with Section 02125 Excavation and Back Fill for Utilities.

B. Trench sides shall be as near vertical as practical considering wall stability and safety. Remove and dispose of defective pipe. Correct trench grade as required and stabilize trench with cement-stabilized sand. Backfill to above top of new pipe as specified in the City of Friendswood Standard Details.

C. Excavated material suitable for backfilling, and meeting specifications of Section 02140 Utility Backfill Material, shall be piled as far as practical from edge of trench, to increase soil stability and allow working room for pipe removal and pipe laying operations. Excess material is to be

removed from the trench bank as soon as possible. Excess material becomes the Contractor's property and it is the Contractor's responsibility to dispose off waste material as specified in Section 01580 Waste Material Disposal.

D. It is the Contractor's responsibility to maintain safe conditions and follow all local, state and federal guidelines for trench safety and Section 02280 Trench Safety Systems. The Contractor shall have a person competent in trench safety or safety officer on site at all times during excavation.

3.3 TRENCH WATER

A. Where practical, ground surfaces shall be graded or diked to prevent the entry of surface water into the open trench.

B. Groundwater entering the open trench from the walls and from a firm bottom in small quantities shall be promptly removed by trench pumps. Multiple pumps in good operating order shall be kept on the excavation site for such purposes at all times. Under such trench conditions, the rough excavation of grades is required to drain water to the pumps prior to under-bedding placement, and with suitable screening to exclude sand from pump suction.

Other methods may be employed by the Contractor to achieve the required results only after such methods submitted to and approved by the Project Manager. The water level shall be maintained below the pipe invert until full compaction of the pipe bedding has been accomplished.

C. In the event that trench pumps are unable to maintain the required level of water, or, if the water entry is from the bottom of the excavation in such quantities as to make the bottom unstable, or, from the sides in such quantities to make the walls unstable, then the Contractor shall provide and operate an effective well point system to dewater the trench for the required pipe laying conditions.

D. Water removed from trenches, from drainage ditches and well points shall be conveyed to the City's drainage system, upstream of erosion control devices. Pumped water shall not be discharged onto the streets, sidewalks or private property.

E. Dewatering or well pointing systems shall be installed and operated so as to minimize inconvenience and annoyance to the public. Mechanical equipment shall be housed or shielded to minimize noise; engines are to be provided with efficient noise mufflers. Points and headers shall

not block pedestrian and vehicular traffic. Location of pumping units shall be chosen for minimum disturbance. Site to be promptly restored to its original or better condition after well point removal.

3.4 PIPE EMBEDMENT

A. After defective pipe is removed, cut or fill trench to rough grade. All fill shall be cement-stabilized sand per Part II Products, of this Section. Place embedment across the width of the trench and approximately to the grade of the bottom of the pipe, with bell hole left open and additional material on the sides. Additional dry, loose material is to be placed in uniformly spaced piles along the pipe (clearing sling points, if any, and bell holes) sufficient to support the lower quadrant of the pipe barrel for thirty percent (30%) or more of its length. The spigot end of pipe is to be set into the receiving bell and lowered against sand. It is to be checked for vertical alignment of spigot vs. bell and for grade. The length is to be worked into true alignment and grade by bumping, and/or adding or removing underbedment material, so pipe piece is uniformly supported, under its own weight, for the lower quadrant for not less that eighty percent (80%) of its length. The pipe piece is then moved horizontally (axially) to make up the joint and additional underbedment material promptly worked under the pipe and tamped to provide full support for its lower one-third (1/3) for its entire length. Joint is to be checked for make-up and exterior protection placement commenced. Pipe bedding material placement shall continue and pipe shall be solidly anchored against axial movement before the next joint is made-up. Remaining bedding and backfill placing shall continue until complete. Trench water shall not rise appreciably until the bedding level is above spring line of pipe.

3.5 BACKFILL

A. Where excavation has resulted in clods not larger than ten inches (10 In) in the largest dimension, the surface excavated material shall be pushed into the trench in layers not thicker than twelve inches (12 In) and compacted. Where excavation has resulted in clods larger than ten inches (10 In) in the largest dimension, then follow this procedure as approved by the Project Manager:

1. The clods are to be removed from the trench area and select imported fill material substituted therefore, or

2. The clods are to be reduced to not greater than allowed above and adequate finer materials sufficient to fill voids between large clods provided. Highly-organic excavated material shall be considered unsuitable and excluded from backfill.

B. Each layer of the backfill is to be mechanically compacted, to densities per ASTM D698 (standard proctor) within plus or minus three percent (±3%) optimum moistures content. Reopen trenches and backfill that does not meet specifications and recompact.

C. Backfill shall be hand-placed and compacted under lines crossing the trench, steep slopes, valves, valve boxes, service connections, manholes, inlets and other appurtenances and structures.

D. Any trench settlement shall be promptly filled, all trenches to be given final dressing immediately after settlement.

E. Final clean-up to follow backfill operation within forty-eight hours (48 Hrs) of construction or earlier if directed by the Project Manager.

3.6 Miscellaneous Precautions and Restoration of Damages.

A. The Contractor shall at all times be vigilant in observing overhead electric power and communication equipment.

B. Damage to overhanging tree limbs shall also be avoided. Damage limbs should be pruned accordingly.

C. All existing facilities (fences, structures, pavements, driveways, sidewalks, trees, gardens, etc.) damaged or removed to facilitate the point repairs shall be restored to as good as or better condition. All cost shall be borne by the Contractor.

END OF SECTION

SECTION 02600

STORM SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. New storm sewers and appurtenances, modifications to existing storm sewer system and installation of roadside ditch culverts.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for storm sewers, including elliptical pipe or box sections, installed by open-cut or augering with or without casing is on a linear foot basis. Measurement for storm sewers and roadside ditch culverts shall be taken along the center line of pipe from center line to center line of manholes or from end to end of culverts. Payment shall be made for each linear foot installed complete in place, including connections to existing manholes and inlets.

2. Payment for storm sewer leads, including elliptical, round or box leads, is on a linear foot basis.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01555 □ Traffic Control and Regulation.

4. Section 01585 Control of Ground and Surface Water.

5. Section 02105 Removing Existing Pavements and Structures.

6. Section 02125 Excavation and Backfill for Utilities.

7. Section 02140 Utility Backfill Material.

8. Section 02145 Cement-Stabilized Sand.

9. Section 02240 Reinforced Concrete Box (RCB).

10. Section 02245 Reinforced Concrete Pipe (RCP).

11. Section 02275 Pipe and Casing Augering for Sanitary Sewers.

12. Section 02300 Cast-in-place Concrete Manholes.

13. Section 02305 Precast Concrete Manholes.

14. Section 02310 Adjusting Manholes, Inlets and Valve Boxes to Grade.

15. Section 02315 Frames, Grates, Rings and Covers.

16. Section 02320 Manhole Rehabilitation.

17. Section 02515 Abandonment of Sanitary Sewers.

18. Section 02520 Television Inspection of Sanitary Sewer Lines.

19. Section 02605 Cast-in-place Inlets, Junction Boxes, Headwalls and Wingwalls.

20. Section 02610 Precast Concrete Inlets, Junction Boxes, Headwalls and Wingwalls.

21. Section 02615 Concrete Brick Manholes for Storm Sewers.

22. Section 02845 Pavement Repair and Resurfacing.

23. Section 02905 Topsoil.

24. Section 02910 Hydromulch Seeding.

25. Section 02915 Sodding.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturer's literature for product specifications and installation instructions.

C. Submit proposed methods, equipment, materials and sequence of operations for storm sewer construction. Plan operations to minimize disruption of utilities serving occupied facilities or adjacent property.

1.5 QUALITY ASSURANCE

A. The condition for acceptance shall be a watertight storm sewer that is watertight both in at all joints and at connections to manholes or inlets.

B. Provide manufacturer's certification to Specifications.

1.6 PRODUCT DELIVERY, STORAGE and HANDLING

A. Comply with manufacturer's recommendations.

B. Handle pipe or boxes, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe or boxes off trucks or trailers. Do not use sections that are cracked, gouged, chipped, dented or otherwise damaged for installation.

C. Store pipe or boxes and fittings on heavy timbers or platforms to avoid contact with ground.

D. Unload pipe or boxes, fittings and appurtenances as close as practical to location of installation to avoid unnecessary handling.

E. Keep interiors of pipe or boxes and fittings free of dirt and foreign matter.

PART II: PRODUCTS

2.1 PIPE

A. Provide pipe or boxes for storm sewers in the sizes and types specified, unless otherwise indicated on the Drawings.

B. In diameters where material alternatives are available, and such

alternatives have been approved by the City, provide pipe or boxes from single manufacturer for each pipe or box size, unless otherwise approved by the Project Manager or otherwise shown on the Drawings.

C. Existing pipe or boxes that have been removed during construction shall not be reused unless approved the Project Manager.

2.2 PIPE MATERIAL SCHEDULE

A. Storm Sewer Pipe or Boxes: Use pipe or boxes that conform to requirements specified in one (1) or more of the following Sections as shown on the Drawings. Polyvinyl Chloride Pipe shall not be used for storm sewers.

1. Section 02240 □ Reinforced Concrete Box (RCB).

2. Section 02245 □ Reinforced Concrete Pipe (RCP).

B. Driveway Culvert Pipe for Streets with Open Ditches: Use pipe or boxes that conform to requirements specified in one (1) or more of the following Sections as shown on the Drawings.

1. Section 02240 □ Reinforced Concrete Box (RCB).

2. Section 02245 □ Reinforced Concrete Pipe (RCP).

C. Provide pipe or boxes meeting minimum class, dimension ratio or other criteria indicated.

D. Pipe or boxes other than those listed above shall not be used for storm sewers.

2.3 BEDDING, BACKFILL and TOPSOIL MATERIAL

A. Bedding and Backfill Material: Conform to requirements of Sections 02125 □ Excavation and Backfill for Utilities, Section 02140 □ Utility Backfill Material and Section 02145 □ Cement-Stabilized Sand.

B. Topsoil: Conform to requirements of Section 02905 □ Topsoil.

C. Use cement-stabilized sand material for bedding and backfill in the pipe or box zone for all storm sewers.

D. For storm sewer pipes forty-two inches (42 In) in diameter and larger or boxes larger than four feet by four feet (4 Ft x 4 Ft); use suitable on-site material or select backfill from twelve inches (12 In) above the pipe

to twelve inches (12 In) below the pavement for backfill.

PART III: EXECUTION

3.1 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction shall affect traffic. Conform to requirements of Section 01555 Traffic Control and Regulation.

B. Provide barricades, flashing warning lights and signs for excavations. Conform to requirements of Section 01555 Traffic Control and Regulation. Maintain barricades and warning lights for streets and intersections while the Work is in progress or where traffic is affected by the Work.

C. Immediately notify agency or company owning utility lines which are damaged, broken or disturbed. Obtain approval from the Project Manager and agency for repairs or relocations, either temporary or permanent.

D. Remove old pavements and structures, including sidewalks and driveways, in accordance with requirements of Section 02105 Removing Existing Pavements and Structures.

E. Install and operate dewatering and surface water control measures in accordance with Section 01585 Control of Ground and Surface Water.

3.2 EXCAVATION

A. Earthwork: Conform to requirements of Section 02125 Excavation and Backfill for Utilities. Use bedding as indicated on the Drawings.

B. Line and Grade: Establish required uniform line and grade trench from benchmarks identified by the Project Manager. Maintain this control for minimum of one hundred feet (100 Ft) behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of the Work or use of appropriately sized grade boards which are substantially supported.

C. Trench Excavation: Excavate trenches to the level indicated on the City's Standard Construction Details. Backfill excavation with specified bedding material to level of lower one-third (1/3) of pipe barrel or box.

Tamp and compact backfill to provide bedding at indicated grade. Form bedding foundation to a minimum depth of one-eighth (1/8) of pipe diameter or box height, but not less than six inches (6 In).

3.3 PIPE INSTALLATION

A. Install in accordance with pipe or boxes manufacturer s recommendations and as specified in this Section.

B. Install pipe or boxes only after excavation is completed, bottom of trench is shaped, bedding material is installed and trench has been approved by the Project Manager.

C. Install pipe or boxes to line and grade indicated on the Drawings. Place pipe or boxes so that it has continuous bearing of barrel or box bottom on bedding material with no voids and is laid in the trench so interior surfaces of pipe or boxes follows grades and alignments indicated.

D. Install pipe or boxes with bells of pipe facing upstream of anticipated flow.

E. Join each section of adjoining pipe or boxes to prevent offsets.

F. Place and drive home newly laid sections with a sling or come-a-long winches to eliminate damage to sections. Unless otherwise approved by the Project Manager, provide end protection to prevent damage while using back hoes or similar powered equipment to drive home newly laid sections.

G. Keep interior of pipe or boxes clean as installation progresses.

H. Keep excavations free of water during construction and until final inspection.

I. When Work is not in progress, cover exposed ends of pipes or boxes with plugs specifically designed to prevent foreign material from entering pipe.

J. Storm sewers identified on the Drawings to be abandoned shall be abandoned in general conformance with Section 2515 Abandonment of Sanitary Sewers.

3.4 PIPE OR BOX INSTALLATION OTHER THAN OPEN CUT

A. Conform to requirements of Section 02275 Pipe and Casing Augering for Sanitary Sewers where required.

3.5 INSTALLATION OF APPURTENANCES

A. Construct manholes to conform to requirements of Sections 02300 Cast-in-place Concrete Manholes, Section 02305 Precast Concrete Manholes and Section 02615 Concrete Brick Manholes for Storm Sewers. Install frames, grate rings and covers to conform to requirements of Section 02315 Frames, Grates, Rings and Covers.

B. Install inlets, headwalls and wingwalls to conform to requirements of Section 02605 Cast-in-place Inlets, Junction Boxes, Headwalls and Wingwalls and Section 02610 Precast Concrete Inlets, Junction Boxes, Headwalls and Wingwalls.

C. Rehabilitate existing manholes and inlets to conform to requirements of Section 02320 Manhole Rehabilitation. Adjust manhole covers and inlets to grade conforming to requirements of Section 02310 Adjusting Manholes, Inlets and Valve Boxes to Grade.

D. Dimension for Type C and Type E manholes shall be as shown on the Drawings.

3.6 INSPECTION AND TESTING

A. Perform post-installation television inspection in accordance with Section 02520 Television Inspection of Sanitary Sewer Lines. Hand held cameras may be used in storm sewers in lieu of requirements of Section 02520 Television Inspection of Sanitary Sewer Lines. Clearly stencil distance markings on each joint of pipe or box to indicate distance from starting manhole when using hand-held cameras.

3.7 BACKFILL AND SITE CLEANUP

A. Backfill trench after pipe or box installation is inspected and approved by the Project Manager.

B. Backfill and compact soil in accordance with Section 02125 Excavation and Backfill for Utilities.

C. Repair and replace removed or damaged pavement and sidewalks as specified in Section 02845 Pavement Repair and Resurfacing.

D. In unpaved areas, grade surface as uniform slope to natural grade as indicated on the Drawings. Provide minimum of four inches (4 In) of topsoil and seed according to requirements of Section 02910 Hydromulch Seeding or Section 02915 Sodding, as required.

END OF SECTION

SECTION 02605

CAST-IN-PLACE INLETS, JUNCTION BOXES, HEADWALLS AND WINGWALLS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cast-in-place inlets for storm sewers, including cast iron frame and plate or grate.

B. Cast-in-place headwalls including wingwalls for storm sewers.

C. Cast-in-place junction box with lid or grate top.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for cast-in-place inlets is on a unit price basis for each inlet installed.

2. Payment for cast-in-place headwalls including wingwalls is on a unit price basis for each headwall including wingwall installed.

3. Payment for cast-in-place junction box with lid or grate top is on a unit price basis for each junction box installed.

4. Payment for inlets, including wingwalls and junction boxes includes connection of lines and furnishing and installing frames, grates, rings and covers.

5. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 02125 Excavation and Backfill for Utilities.
4. Section 02315 Frames, Grates, Rings and Covers.
5. Section 03100 Mortar.
6. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit shop drawings for approval of design and construction details for cast-in-place units which differ from units shown on the Drawings.

C. Submit manufacturers data and details for frames, grates, rings and covers.

1.5 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that material was manufactured in compliance with standards and Technical Specifications referenced in this Section.

PART II: P R O D U C T S

2.1 MATERIALS

A. Concrete: Class A concrete with a minimum compressive strength of four thousand pounds per square inch (4000 psi) conforming to requirements of Section 03300 Structural Concrete, unless otherwise indicated on the Drawings.

B. Reinforcing Steel: Conform to requirements of Section 03300 Structural Concrete.

C. Mortar and Hydraulic Cement Conform to requirements of Section 03100 Mortar.

D. Miscellaneous metals: Cast-iron frames, grates, rings and covers conforming to requirements of Section 02315 Frames, Grates, Rings

and Covers.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify lines and grades are correct.

B. Verify compacted subgrade shall support loads imposed by inlets, junction boxes, headwalls and wingwalls.

3.2 INSTALLATION

A. Construct units complete in place to dimensions, lines and grades as shown on the Drawings.

B. Excavate in accordance with requirements of Section 02125 Excavation and Backfill for Utilities.

C. Construct box section of inlets, junction boxes, headwalls and wingwalls of Class A concrete.

D. Forms required for both outside and inside faces of concrete inlet, junction box, headwall or wingwall walls; however, when nature of material excavated for inlet or junction box can be hand trimmed to smooth outside vertical face, outside forms may be omitted with approval of the Project Manager. When nature of material excavated for headwall or wingwall walls can be hand trimmed to a smooth backside vertical face, backside forms may be omitted with approval of the Project Manager.

E. Place reinforcing steel to conform to details shown on the Drawings. Provide positive means for holding steel cages in place during concrete placement. Welding of reinforcing steel is not permitted unless noted on the Drawings. A maximum variation in reinforcement position is plus or minus ten percent (10%) of wall thickness or plus or minus one-half inch (±1/2 In), whichever is less. Regardless of variation, maintain a minimum cover of concrete over reinforcement as shown on the Drawings.

F. Chamfer exposed edges unless otherwise indicated on the Drawings.

3.3 FINISHES

A. Cut off inlet or junction box leads neatly at inside face of inlet or junction box wall, or at outside face of headwall. Point up with mortar.

B. When box section of inlet or junction box complete, shape floor of inlet junction box with mortar to conform to detailed the Drawings.

C. Finish all concrete surfaces in accordance with requirements of Section 03300 Structural Concrete.

3.4 QUALITY CONTROL

A. Verify that inlets and junction boxes are free of leaks. Repair leaks in approved manner.

3.5 CONNECTIONS

A. Connect storm sewer leads to inlets and junction boxes as shown on the Drawings. Seal all connections inside and outside with hydraulic cement. Make connections watertight.

3.6 BACKFILL

A. Backfill area of excavation surrounding each completed inlet, junction box, headwall and wingwalls according to requirements of Section 02125 Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02610

PRECAST CONCRETE INLETS, JUNCTION BOXES, HEADWALLS AND WINGWALLS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Precast concrete inlets for storm sewers, including cast iron frame and plate or grate.

B. Precast concrete headwalls and wingwalls for storm sewers.

C. Precast junction box with lid or grate top.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for precast concrete inlets is on a unit price basis for each inlet installed.

2. Payment for precast concrete headwalls and wingwalls is on a unit price basis for each headwall and wingwall installed.

3. Payment for precast concrete junction box with lid or grate top is on a unit price basis for each junction box installed.

4. Payment for inlets, junction boxes, headwalls, and wingwalls includes connection of lines and furnishing and installing frames, grates, rings and covers.

5. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. CFTS – City of Friendswood Technical Specifications..

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02125 – Excavation and Backfill for Utilities.

4. Section 02315 – Frames, Grates, Rings and Covers.

5. Section 03100 – Mortar.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit shop drawings for approval of design and construction details for precast concrete inlets, junction box headwalls and wingwalls. Precast units differing from standard designs shown on the Drawings shall be rejected unless shop drawing submittals are approved. Clearly show proposed substitution is equal or superior in every aspect to standard designs.

C. Submit manufacturers' data and details for frames, grates, rings and covers.

1.5 STORAGE AND SHIPMENT

A. Store precast units on level blocking. Do not place loads until design strength is reached. Shipment of acceptable units may be made when twenty-eight day (28 D) strength requirements have been met.

1.6 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with standards and Technical Specifications referenced in this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Concrete: Provide concrete for precast machine-made units meeting requirements of ASTM C76 regarding reinforced concrete, cement, aggregate, mixture and concrete test. A minimum twenty-eight day (28 D) compressive strength shall be four thousand pounds per square inch (4000 psi).

B. Reinforcing Steel: Place reinforcing steel to conform to details shown on the Drawings and as follows:

1. Provide positive means for holding steel cages in place throughout production of concrete units. A maximum variation in reinforcement position is plus or minus ten percent (±10%) of wall thickness or plus or minus one-half inch (±1/2 In), whichever is less. Regardless of variation, maintain a minimum cover of concrete over reinforcement as shown on the Drawings.

2. Welding of reinforcing steel is not permitted unless noted on the Drawings.

C. Mortar and Hydraulic Cement: Conform to requirements of Section 03100 Mortar.

D. Miscellaneous Metal: Cast-iron frames and plates conforming to requirements of Section 02315 Frames, Grates, Rings and Covers.

2.2 SOURCE QUALITY CONTROL

A. Tolerances: Allowable casting tolerances for concrete units are plus or minus one-quarter inch (1/4 In) from dimensions shown on the Drawings. Concrete thickness in excess of that required shall not constitute cause for rejection provided that excess thickness does not interfere with proper jointing operations.

B. Precast Unit Identification: Mark date of manufacture and name or trademark of manufacturer clearly on inside of inlet, headwall or wingwall.

C. Rejection: Precast units rejected for non-conformity with these specifications and for following reasons:

1. Fractures or cracks passing through shell, except for single end

crack that does not exceed depth of joint.

2. Surface defects indicating honeycombed or open texture.

3. Damaged or misshaped ends, where damage would prevent making satisfactory joint.

D. Replacement: Immediately remove rejected units from the Work site and replace with acceptable units.

E. Repairs: Occasional imperfections resulting from manufacture or accidental damage may be repaired if, in opinion of the Project Manager, repaired units conform to requirements of these specifications.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify lines and grades are correct.

B. Verify compacted subgrade shall support loads imposed by inlets, junction boxes, headwalls and wingwalls.

3.2 INSTALLATION

A. Install units complete in place to dimensions, lines and grades as shown on the Drawings.

B. Excavate in accordance with requirements of Section 02125 Excavation and Backfill for Utilities.

C. Bed precast concrete units on foundations of firm, stable material shaped to conform to shape of unit bases.

D. Provide adequate means to lift and place concrete units without damage.

3.3 FINISHES

A. Use hydraulic cement to seal joints, fill lifting holes and as otherwise required.

B. When box section of inlet or junction box has been completed, shape floor of inlet or junction box with mortar to conform to the Drawing details.

C. Adjust cast iron inlet plate frames to line, grade and slope shown on the Drawings. Grout frame in place with mortar conforming to Section 03100 Mortar.

3.4 QUALITY CONTROL

A. Verify that inlets and junction boxes are free of leaks. Repair leaks in approved manner.

3.5 CONNECTIONS

A. Connect storm sewer leads to inlets as shown on the Drawings. Seal connections inside and outside with hydraulic cement. Make connections watertight.

3.6 BACKFILL

A. Backfill area of excavation surrounding each completed inlet, junction box, headwall or wingwall according to requirements of Section 02125 Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02615

CONCRETE BRICK MANHOLES FOR STORM SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Concrete Brick masonry Work in utility construction for permanent or temporary installation of storm sewer manholes or vaults.

B. Concrete Brick masonry in repair and rehabilitation of storm sewer lines and associated structures.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for concrete brick manholes is on a unit price basis for each manhole installed.

2. No payment shall be made for concrete brick masonry work for repair and rehabilitation of storm water lines. Include payment in the unit price for applicable structure section.

3. Refer to Section 01270 Measurement and Payment for Unit Price Procedures.

B. Stipulated Price (Lump Sum):

1. When Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600kN-m/m^3)).

B. City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02120 Excavation and Backfill for Structures.

4. Section 02315 Frame, Grates, Rings and Covers.

5. Section 02905 Topsoil.

6. Section 02910 Hydromulch Seeding.

7. Section 02915 Sodding.

8. Section 03100 Mortar.

9. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certifications required by Section 03100 Mortar.

C. Submit certifications required by this Section.

1.5 HANDLING AND STORAGE

A. Handle and store concrete brick to prevent damage.

B. Store concrete brick and mortar mix off ground and keep dry. Cover mortar mix to protect from weather.

1.6 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that material was manufactured in compliance with standards referenced in this section.

PART II: PRODUCTS

2.1 CONCRETE BRICK MASONRY UNITS

A. Concrete manhole bricks.

1. Concrete brick masonry units conforming to requirements of

this Section.

2.2 MORTAR

A. Conform to requirements of Section 03100 Mortar.

2.3 CONCRETE AND REINFORCING STEEL

A. Conform to requirements of Section 03300 Structural Concrete.

B. Provide Class A concrete with a minimum compressive strength of 4000 psi unless otherwise indicated on the Drawings.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to be ninety-five percent (95%) of a maximum Standard Proctor Density according to ASTM D698 prior to placement of foundation material and base section. When it cannot be compacted to that density, moisture condition subgrade until that density is reached or treat as unstable subgrade.

C. Concrete brick manhole to be used only as indicated on the Drawings or as approved by the City.

D. Do not build manholes of concrete brick in or under paving, in rights of way, easements, on any public land or on private land that may be deeded over to or under City maintenance in the future.

E. Do not build manholes in ditches, swales or drainage ways unless approved by the Project Manager.

3.2 MANHOLES

A. Construct manholes to dimensions shown on the Drawings. Commence construction as soon as possible after pipes or boxes are laid. On monolithic storm sewers, construct manholes at same time storm sewer is being constructed.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify the Project Manager for examination of subgrade to

determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for twenty-four inch (24 in) thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on the Drawings, under manhole base.

C. Construct manhole on concrete slab in accordance with requirements of this Section.

D. The top and throat section on curb style inlets shall be concrete and as per the City of Friendswood Standard Details Sheet.

E. Concrete brick manholes and inlets shall be grouted inside and out, leaving no trace of brick, and as per Section 3100 Mortar.

3.3 PIPE CONNECTIONS

A. Use non-shrink grout to seal pipe or box connections to manholes unless otherwise shown on the Drawings.

3.4 FRAME AND COVER

A. Install frame and cover in accordance with Section 02315 Frame, Grates, Rings and Covers.

3.5 BACKFILL

A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Section 02120 Excavation and Backfill for Structures. Use embedment zone backfill material, as shown in the City of Friendswood Standard Details over each pipe connected to manhole. Provide trench zone backfill, above embedment zone backfill for each pipe or box connected to manhole.

B. Backfill under existing storm sewer up to springline of pipe or mid-point of boxes with Class B concrete or flowable fill in accordance with Section 03300 Structural Concrete.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide a minimum of four inches (4 in) of topsoil conforming to requirements of Section 02905 Topsoil. Seed in accordance with Section 02910 Hydromulch Seeding or sod disturbed areas in accordance with Section 02915 Sodding.

3.6 QUALITY CONTROL

A. Visually inspect manhole for leakage. Repair leaks in an approved manner.

3.7 CONNECTIONS

A. Connect storm sewer leads to manholes as shown on the Drawings. Seal connections inside and outside with hydraulic cement. Make connections watertight.

3.8 PROTECTION

A. Protect manholes from damage until subsequent work has been accepted. Repair or replace damaged elements of manholes at no additional cost to the City.

END OF SECTION

SECTION 02700

CEMENT-STABILIZED BASE COURSE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Foundation course of cement-stabilized crushed stone.

B. Foundation course of cement-stabilized bank run gravel.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for cement-stabilized base course is on a square yard basis. Separate pay items are used for each different required thickness of base course.

2. Payment for asphaltic seal cure is by the gallon.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

4. Refer to Paragraph 3.9, Unit Price Adjustment.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in Los Angeles Machine.

2. ASTM C150 Standard Specification for Portland Cement.

3. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft_3 (600kN kN-m/m_3).

4. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

5. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

6. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 02115 – Embankment.

6. Section 02135 – Excavation for Roadway.

7. Section 02730 – Prime Coat.

C. TxDOT – Texas Department of Transportation.

1. TxDOT Tex-101-E – Preparing Soil and Flexible Base Materials for Testing.

2. TxDOT Tex-110-E – Particle Size Analysis of Soils.

3. TxDOT Tex-120-E – Soil-Cement Testing.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit samples of crushed stone, gravel and soil binder for testing.

C. Submit manufacturer's description and characteristics for pug mill and associated equipment, spreading machine and compaction equipment for approval.

1.5 TESTS

A. Perform testing under provisions of Sections 01470 Testing Laboratory Services and Section 01475 Quality Control Testing Procedures.

B. Perform tests and analysis of aggregate and binder materials in accordance with ASTM D1557 and ASTM D4318.

1.6 DELIVERY, STORAGE AND HANDLING

A. Make stockpiles from layers of processed aggregate to eliminate segregation of materials. Load material by making successive vertical cuts through entire depth of stockpile.

B. Store cement in weatherproof enclosures. Protect from ground dampness.

1.7 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with standards and Technical Specifications referenced in this Section.

PART II: PRODUCTS

2.1 CEMENT

A. ASTM C150 Type I; bulk or sacked.

2.2 WATER

A. Clean, clear; and free from oil, acids, alkali or vegetable matter.

2.3 AGGREGATE

A. Crushed Stone: Material retained on No. 40 Sieve meeting following requirements:

1. Durable particles of crusher-run broken limestone, sandstone or granite obtained from approved source.

2. Los Angeles abrasion test percent of wear not to exceed forty (40) when tested in accordance with ASTM C131.

B. Gravel: Durable particles of bank run gravel or processed material.

C. Soil Binder: Material passing No. 40 Sieve meeting following requirements when tested in accordance with ASTM D4318:

1. Maximum Liquid limit: thirty-five (35).

2. Maximum Plasticity index: ten (10).

D. Mixed aggregate and soil binder shall meet the following requirements:

1. Grading in accordance with TxDOT Tex-101-E and Tex-110-E within the specified limits in TABLE 4.1 SIEVE ANALYSIS.

2. Obtain prior permission from the Project Manager for use of additives to meet above requirements.

2.4 ASPHALT SEAL CURE

A. Cutback Asphalt: MC30 conforming to requirements of Section 02730 Prime Coat.

B. Emulsified Petroleum Resin: EPR-1 Prime conforming to requirements of Section 02730 Prime Coat.

2.5 MATERIAL MIX

A. Design mix for a minimum average compressive strength of two hundred pounds per square inch (200 psi) at forty-eight hours (48 Hrs) using TxDOT Tex-120-E unconfined compressive strength testing procedures. Provide a minimum cement content of one and one-half (1-1/2) sacks, weighing ninety-four pounds (94 Lbs) each, per ton of mix.

B. Increase cement content when average compressive strength of tests on field samples fall below two hundred pounds per square inch (200 psi). Refer to Part III concerning field samples and tests.

C. Mix in stationary pug mill equipped with feeding and metering devices for adding specified quantities of base material, cement and water into mixer. Dry mix base material and cement sufficiently to prevent cement balls from forming when water is added.

D. Resulting mixture shall be homogeneous and uniform in appearance.

2.6 SOURCE QUALITY CONTROL

A. Perform testing under provisions of Sections 01470 Testing Laboratory Services and Section 01475 Quality Control Testing Procedures.

B. Perform testing for unconfined compressive strength by TxDOT Test Method Tex-120-E as follows:

1. Mold a minimum of three (3) samples each day or three (3) for each three hundred tons (300 Tn) of production.

2. Compressive strength shall be the average of the minimum of three (3) samples or of the three (3) tests for each production lot.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Prepare subgrade in accordance with requirements of Section 02115 Embankment and Section 02135 Excavation for Roadway.

C. Correct subgrade deviations in excess of plus or minus one-quarter inch (±1/4 In) in cross section or in sixteen foot (16 Ft) length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

D. Prepare sufficient subgrade in advance of base course for efficient operations.

3.3 PLACEMENT

A. Do not mix and place cement-stabilized base when the ambient temperature is below forty degrees Fahrenheit (40° F) and falling. Base may be placed when the ambient temperature taken in the shade and away from artificial heat is above thirty-five degrees Fahrenheit (35° F) and rising.

B. Place material on prepared subgrade in uniform layers to produce thickness indicated on the Drawings. Depth compacted of layers shall not exceed six inches (6 In).

C. Spread with approved spreading machine. Conduct spreading so as to eliminate planes of weakness or pockets of non-uniformly graded material resulting from hauling and dumping operations.

D. Provide construction joints between new material and stabilized base that has been in place four hours (4 Hrs) or longer. Joints shall be approximately vertical. Form joint with temporary header or make vertical cut of previous base immediately before placing subsequent base.

E. Use only one (1) longitudinal joint at center line under main lanes and shoulder unless shown otherwise on the Drawings. Do not use longitudinal joints under frontage roads and ramps unless indicated on the Drawings.

F. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Ensure proper firm bond between reinforcement and base.

3.4 COMPACTION

A. Start compaction as soon as possible but not more than sixty minutes (60 Mins) from start of moist mixing. Compact loose mixture with approved tamping rollers until entire depth is uniformly compacted. Do not allow stabilized base to mix with underlying material.

B. Correct irregularities or weak spots immediately by replacing material and recompacting.

C. Apply water to maintain moisture between optimum and two percent (2%) above optimum moisture as determined by ASTM D698. Mix in with spiked tooth harrow or equal. Reshape surface and lightly scarify to loosen imprints made by equipment.

D. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.

E. Finish by blading surface to final grade after compacting final course. Seal with approved pneumatic-tired rollers which are sufficiently light to prevent surface hair line cracking. Rework and recompact at areas where hair line cracking develops.

F. Compact to a minimum density of ninety-five percent (95%) of maximum dry density at moisture content of treated material between optimum and two percent (2%) above optimum as determined by ASTM D1557, unless otherwise indicated on the Drawings.

G. Maintain surface to required lines and grades throughout operation.

3.5 CURING

A. Moist cure for a minimum of seven days (7 D) before adding pavement courses. Restrict traffic on base to local property access. Keep subgrade surface damp by sprinkling.

B. If indicated on the Drawings, cover base surface with curing membrane as soon as finishing operation is complete. Apply with approved self-propelled pressure distributor at following rates or as indicated on the Drawings:

1. MC30: One tenth gallon per square yard (0.1 Gal/Sy).

2. EPR-1 Prime: Fifteen hundredths gallon per square yard (0.15 Gal/Sy).

C. Do not use cutback asphalt during period of April 16th to September 15th.

3.6 TOLERANCES

A. Smooth and conform completed surface to typical section and established lines and grades.

B. Top surface of base course: Plus or minus one and one-quarter inches (±1-1/4 In) in cross section or in sixteen feet (16 Ft) of length.

3.7 FIELD QUALITY CONTROL

A. Perform testing under provisions of Sections 01470 Testing Laboratory Services and Section 01475 Quality Control Testing Procedures.

B. Take a minimum of one (1) core at random locations per one thousand linear feet (1000 Lf) per lane of roadway or one (1) per every five hundred square yards (500 Sy) of base to determine in-place depth.

C. Request additional cores in vicinity of cores indicating nonconforming

in-place depths at no extra cost to the City. When average of tests fall below required depth, place additional material and compact at no additional cost to the City.

D. Perform compaction testing in accordance with ASTM D698 or ASTM D2922 and ASTM D3017 at randomly selected locations. Remove and replace areas that do not conform to compaction requirements at no additional cost to the City.

E. Fill cores and density test sections with new compacted cement-stabilized base.

3.8 NONCONFORMING BASE COURSE

A. Remove and replace areas of base course found deficient in thickness by more than ten percent (10%), or that fail compressive strength tests, with cement-stabilized base of thickness shown on the Drawings.

B. Replace nonconforming base course sections at no additional cost to the City.

3.9 UNIT PRICE ADJUSTMENT

A. Make the unit price adjustments for in-place depth determined by cores as follows:

1. Adjusted unit price shall be ratio of average thickness as determined by cores to thickness bid upon, times the unit price.

2. Apply adjustment to lower limit of ninety percent (90%) and upper limit of one hundred percent (100%) of the unit price.

3.10 PROTECTION

A. Maintain stabilized base in good condition until completion of Work. Repair defects immediately by replacing base to full depth.

B. Protect asphalt membrane, when used, from being picked up by traffic. Membrane may remain in place when proposed surface courses or other base courses are to be applied.

PART IV: TABLES

4.1 SIEVE ANALYSIS

Sieve	**Percent Retained**			
	Crushed Stone	Processed G. 1	Processed G. 2	Bank run Gravel
1 3/4 inch	0 to 10	0 to 5	-	0 to 5
1/2 inch	-	-	0	-
No. 4	45 to 75	30 to 75	15 to 35	30 to 75
No. 40	55 to 80	60 to 85	55 to 85	65 to 85

END OF SECTION

SECTION 02705

CRUSHED CONCRETE BASE COURSE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Crushed concrete base course.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Crushed Concrete Base Course is on a per ton basis furnished and compacted in place.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C150 Standard Specification for Portland Cement.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01455 Inspection Services.

4. Section 01470 Testing Laboratory Services.

5. Section 01475 Quality Control Testing Procedures.

6. Section 02115 Embankment.

7. Section 02135 □ Excavation for Roadway.

8. Section 02720 □ Lime-Stabilized Base Subgrade.

9. Section 02725 □ Portland Cement-Stabilized Base Subgrade.

10. Section 02730 □ Prime Coat.

C. TxDOT □ Texas Department of Transportation.

1. TxDOT Tex-101-E □ Preparing Soil and Flexible Base Materials for Testing.

2. TxDOT Tex-106-E □ Calculating the Plasticity Index of Soils.

3. TxDOT Tex-110-E □ Determining Particle Size Analysis of Soils.

4. TxDOT Tex-113-E □ Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials.

5. TxDOT Tex-115-E □ Field Method for Determining In-place Density of Soils and Base Materials.

6. TxDOT Tex-120-E □ Soil-Cement Testing.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit representative samples of crushed concrete for testing.

C. Submit weight tickets, certified by supplier, for each delivery of recycled crushed concrete, gravel and soil binder.

D. Submit manufacturer□s description and characteristics for pug mill and associated equipment, mixer trucks, spreading and compaction equipment for approval.

1.5 TESTS

A. Follow Sections 01470 □ Testing Laboratory Services and 01475 □ Quality Control Testing Procedures.

B. Test and analyze aggregate and binder products following TxDOT Tex-110-E.

1.6 DELIVERY, STORAGE AND HANDLING

A. Provide materials from stockpiles that are protected during storage from contaminates detrimental to concrete base.

B. Load material from same area of stockpile to maintain uniformity of each successive delivery to the Project site.

C. Store cement in weatherproof enclosures. Protect from ground dampness.

1.7 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that material was manufactured in compliance with standards and Technical Specifications referenced in this Section.

PART II: PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Provide Crushed Concrete Base Course with following performance:

1. Minimum seven percent (7%) cement content.

2. Minimum compressive strength: Six hundred fifty pounds per square inch (650 psi) at fourteen days (14 D) following TxDOT Tex-120-E.

3. Prepare concrete product in on-site or off-site pug mill or in on-site or off-site portable concrete mixer.

B. Preliminary Design: Prepare preliminary mix with minimum cement to crushed concrete ratios of five percent (5%) by dry mass of materials.

1. Designate source of concrete for crushing. Follow Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures for tests of concrete from source.

2. Results of laboratory and compression tests shall be used by the Project Manager to select final mix design.

2.2 PORTLAND CEMENT

A. ASTM C150 Type I, II or III; bulk or sacked.

2.3 WATER

A. Potable.

2.4 AGGREGATE

A. Recycled Crushed Concrete: Material retained on No. 40 Sieve and durable coarse particles of crusher-run reclaimed cured Portland cement concrete, obtained from approved source. Organic material of any kind is prohibited in crushed concrete. The crushed concrete shall be substantially free of foreign matter including, but not limited to, asphalt, base and dirt.

B. Soil Binder (classified below): Meeting following requirements when tested following TxDOT Tex-106-E:

1. Maximum liquid limit: thirty-five (35).

2. Maximum plasticity index: ten (10).

C. Mixed Aggregate and Soil Binder: Grading following TxDOT Tex-101-E and Tex-110-E as specified in TABLE 4.1 MIXED AGGREGATE AND SOIL BINDER in this Section.

2. Bank sand may be added to mix at pug mill.

2.5 ASPHALTIC SEAL CURE

A. Acquire written approval from the Project Manager before curing and before proceeding with curing.

B. Use following as option to curing by sprinkling:

1. Cut-back asphalt: MC30 following Section 02730 Prime Coat.

2. Emulsified petroleum resin: EPR-1 Prime following Section 02730 Prime Coat.

2.6 MATERIAL MIX

A. Design mix for a minimum compressive strength of six hundred fifty pounds per square inch (650 psi) at fourteen days (14 D) following TxDOT Tex-120-E unconfined compressive strength.

B. Cement Ratio: Follow paragraph 2.1.A. Increase cement content in two percent (2%) steps up to nine percent (9%) maximum when compressive strength of design mix samples fail TxDOT Tex-120-E test.

2.7 MIXING EQUIPMENT

A. Mix following Paragraph 2.1.A, with metering devices adding specified quantities of crushed concrete, cement and water into mixer. Dry mix crushed concrete and cement prior to adding water. Produce homogeneous and uniformly mixed product.

2.8 SOURCE QUALITY CONTROL

A. Test following Sections 01470 -Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. When directed by the Project Manager, test for unconfined compressive strength following Test Method TxDOT Tex-120-E as follows:

1. Mold a minimum of three (3) samples each day or three (3) for each five hundred tons (500 Tn) of production or one (1) for each day.

2. Compressive strength: shall be the average of the minimum three (3) samples or three (3) for each production lot.

PART III: EXECUTION

3.1 EXAMINATION

A. Follow Section 01455 Inspection Services.

B. Verify buried utility work is complete.

C. Verify lime treatment of base is complete.

D. Verify subgrade is ready to support imposed loads.

E. Verify flatwork, foundations, projecting reinforcement and similar work interfacing with base is in place.

F. Verify lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Prepare subgrade in accordance with requirements of Section 02115 Embankment and Section 02135 Excavation for Roadway or Section 02720 Lime-Stabilized Base Subgrade and Section 02725 Portland Cement-Stabilized Base Subgrade.

C. Correct subgrade deviations in excess of plus or minus one-quarter inch (1/4 In) in cross section or in sixteen foot (16 Ft) length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

D. Prepare sufficient subgrade in advance of base course for efficient operations.

E. Have sufficient products and equipment on hand to expeditiously apply base.

3.3 MIXING

A. Maintain moisture content of between optimum and five percent (5%) above optimum.

3.4 PLACEMENT

A. Place mixture with approved spreading equipment. Spread to eliminate planes of weakness or pockets of nonuniformly graded material resulting from hauling and dumping operations.

B. Provide approximately vertical construction joints between fresh base and base-in-place four hours (4 Hrs) or longer. Form joint with temporary header or make vertical cut of in-place base immediately before placing fresh base.

C. Make cold joints at center line of head-to-head parking stalls.

D. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Ensure proper bond between reinforcement and base.

E. Transverse and longitudinal joints shall be vertical.

F. Unless noted otherwise, place recycled crushed concrete base in courses not to exceed eight inches (8 In) in depth. All courses shall be

placed on same working day unless approved by the Project Manager. Construction joints between new base and base previously placed shall be wetted and coated with dry cement prior to addition of new base.

G. Complete finishing operations within period of six hours (6 Hrs) after cement is added to base materials.

3.5 COMPACTION

A. Start compaction a maximum three hours (3 Hrs) after start of mixing. Compact loose mixture with approved tamping rollers until entire depth is uniformly compacted. Do not allow base to mix with underlying material.

1. Do not rework uncompacted material that has set up for more than thirty minutes (30 Min).

2. Complete placement and compaction work within six hours (6 Hrs) from start of moist mixing.

B. Correct irregularities or weak spots immediately by replacing material and recompacting.

C. Apply water to maintain moisture between optimum and five percent (5%) above optimum moisture.

D. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.

E. Finish by blading surface to final grade after compacting final course. Seal with approved pneumatic tired rollers or flat wheel rollers which are sufficiently light to prevent surface hair line cracking.

F. Compact to a minimum density of ninety-five percent (95%) of dry density, following TxDOT Tex -113-E, at moisture content of treated material between optimum and five percent (5%) above optimum.

G. Test roadway base course compaction in accordance with TxDOT Tex-115-E.

H. Maintain surface to required lines and grades throughout operation.

3.6 CURING

A. Moist cure for a minimum of seventy-two hours (72 Hrs) before adding pavement courses.

B. Use sprinkling or, at option, apply following curing membrane as soon as initial set begins, using approved light-weight self-propelled pressure distributor:

1. MC30: One tenth gallon per square yard (0.1 Gal/Sy).

2. EPR-1 Prime: Fifteen hundredths gallon of asphalt residual per square yard (0.15 Gal/Sy).

C. Do not use cut-back asphalt during period of April 16th through September 15th.

3.7 TOLERANCES

A. Completed Surface: Smooth and conform to typical section and established lines and grades.

B. Top Surface of Base Course: Plus or minus one-quarter inch (±1/4 In) in cross section or in sixteen feet (16 Ft) of length.

3.8 FIELD QUALITY CONTROL

A. Test following Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Perform compaction tests following TxDOT Tex-113-E at randomly selected locations. Remove and replace areas failing compaction requirements at no additional cost to the City.

3.9 PROTECTION

A. Maintain base in proper condition until surface is placed. Surface must be placed within fourteen days (14 D) after final mixing and compaction unless otherwise approved by the Project Manager. Repair unacceptable base course immediately by replacing base to full depth.

B. Curing membrane may remain in place at areas where surface courses or other base courses are applied.

C. Prevent construction traffic on base for a minimum three days (3 D). Light vehicles, used to maintain proper cure, are permitted on base after initial set or as permitted by the Project Manager.

PART IV: TABLES

4.1 MIXED AGGREGATE AND SOIL BINDER

Sieve	Percent Crushed Concrete Retained
1 3/4 inch	0 to 10
No. 4	45 to 75
No. 40	55 to 85*
* Classified as Soil Binder	

END OF SECTION

SECTION 02710

FLEXIBLE BASE COURSE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Foundation course of crushed concrete or stone.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES:

1. Measurement for flexible base is on a square yard basis. Separate measurement shall be made for each different required thickness of base course.

2. Refer to Section 01290 Payment Procedures for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D1556 Density of Soil in Place by the Sand-Cone Method.

2. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12.44 ft-lbf/ft3).

3. ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM D361 Test Method for Water Content of Soils and Rock in Place by Nuclear Methods (shallow depth).

5. ASTM D3017 Test Method for Water Content of Soils and Rock in Place by Nuclear Methods.

6. ASTM D4318 – Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 02115 – Embankment.

6. Section 02135 – Excavation for Roadway.

7. Section 02720 – Lime-Stabilized Base Subgrade.

C. TxDOT – Texas Department of Transportation.

1. TxDOT Tex-101-E – Preparation of Soil and Flexible Base Materials for Testing.

2. TxDOT Tex-110-E – Determination of Particle Size Analysis of Soils.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Section 01330 – Submittals Procedures.

B. Submit samples of flexible base course and soil binder for testing.

1.5 TESTS

A. Tests and analysis of soil materials shall be performed in accordance with ASTM C131, ASTM D698, ASTM D4318, Tex-101-E and Tex-110-E under provisions of Sections 01470 – Testing Laboratory Services and 01475 Quality Control Testing Procedures.

1.6 DELIVERY, STORAGE and HANDLING

A. Provide materials from stockpiles that are protected during storage from contaminates that would be detrimental to the flexible base course.

B. Load materials from same area of stockpile to maintain uniformity of each successive delivery to the project site.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Crushed Stone or Concrete: Material retained on the No. 40 sieve meeting the following requirements:

1. Durable particles of crusher-run broken limestone, crushed concrete, crushed sandstone or granite obtained from an approved source.

B. Soil Binder: Material passing the No. 40 sieve meeting the following requirements when tested in accordance with ASTM D4318:

1. Maximum Liquid Limit: forty (40).

2. Maximum Plasticity Index: twelve (12).

3. Maximum Lineal Shrinkage: seven (7) (when calculated from volumetric shrinkage at liquid limit).

C. Mixed Materials shall meet the following requirements:

1. Minimum compressive strength of thirty-five pounds per square inch (35 psi) at zero pounds per square inch (0 psi) lateral pressure and one hundred seventy-five pounds per square inch (175 psi) at fifteen pounds per square inch (15 psi) lateral pressure using triaxial testing procedures.

2. Grading in accordance with Tex-101-E and Tex-110-E within the limits specified in TABLE 4.1 – SIEVE ANALYSIS in this Section.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Prepare subgrade in accordance with requirements of Section 02115 Embankment and Section 02135 Excavation for Roadway or Section 022720 Lime-Stabilized Base Subgrade.

C. Correct subgrade deviations in excess of plus or minus one-half inch (1/2 In) in cross section or in sixteen foot (16 Ft) length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

D. Prepare sufficient subgrade in advance of base course operations.

3.3 PLACEMENT

A. Spread and shape in lifts to compacted thickness not to exceed six inches (6 In) in depth. Complete spreading, shaping and compacting on same day material is deposited.

B. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Secure a firm bond between reinforcement and base.

C. Start rolling operations as soon as possible after placement. Use sheepsfoot, steel or pneumatic rollers as approved. Roll longitudinally with subgrade starting from sides. Overlap successive strips by one-half (1/2) width of each rear wheel.

D. Maintain moisture between optimum and three percent (3%) above optimum moisture.

E. Compact to ninety-five percent (95%) of Proctor density in accordance with ASTM D698, unless otherwise indicated on the Drawings.

F. Finish to grade and compact lift before placing successive lift.

G. Maintain shape by grading throughout operation.

H. Provide total thickness indicated on the Drawings.

3.4 TOLERANCES

A. Completed surface shall be smooth and conform to typical section and established lines and grades.

3.5 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Compaction Testing shall be performed in accordance with ASTM D698 or ASTM D2922 and ASTM 3017 at a random location near each depth determination core.

C. Rework and recompact areas that do not conform to compaction requirements.

3.6 PROTECTION

A. Sprinkle to prevent excessive loss of moisture.

B. Restrict construction traffic on finished base to equipment required to complete the work.

PART IV: TABLES

4.1 SIEVE ANALYSIS

Sieve	Percent Retained
1-3/4 inch	0 to 10
No. 4	45 to 75
No. 40	60 to 85

END OF SECTION

SECTION 02715

HOT-MIX ASPHALT BASE COURSE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Foundation course of compacted mixture of coarse and fine aggregates and asphalt binder (Black Base).

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for hot-mix asphalt base is on a per ton basis.

2. Payment for hot-mix asphalt base for transitions and base repairs is on a per ton basis.

3. Payment for hot-mix asphaltic base for temporary driveway, roadway shoulders, etc., is on a per ton basis.

4. Measurement for utility projects:

   a. Actual pavement replaced but not beyond the maximum pavement replacement limits shown on the Drawings.

   b. Include installed hot-mix asphalt base course material that extends one foot (1 Ft) beyond outside edge of pavement to be replaced, except where proposed pavement section shares common edge with existing pavement section.

5. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHO American Association of State Highway and Transportation Officials.

1. AASHTO T201 Standard Specification for Kinematic Viscosity of Asphalts (Bitumens).

2. AASHTO T202 Standard Specification for Viscosity of Asphalt by Vacuum Capillary Viscometer.

B. ASTM American Society for Testing and Materials.

1. ASTM C33 Standard Specifications for Concrete Aggregate.

2. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

3. ASTM C136 Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

4. ASTM D4402 Standard Test Method for Viscosity Determination of unfilled Asphalt Using the Broolfield Thermal Apparatus.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 02115 Embankment.

6. Section 02135 Excavation for Roadway.

7. Section 02145 Cement-Stabilized Sand.

8. Section 02705 Crushed Concrete Base Course.

9. Section 02720 Lime-Stabilized Base Subgrade.

10. Section 02725 Portland Cement-Stabilized Base Subgrade.

D. TxDOT Texas Department of Transportation.

1. TxDOT Tex-106-E Calculating the Plasticity Index of Soils.

2. TxDOT Tex-126-E Molding, Testing and Evaluating Bituminous Black Base Material.

3. TxDOT Tex-200-F Sieve Analysis of Fine and Coarse Aggregates.

4. TxDOT Tex-203-F Sand Equivalent Test.

5. TxDOT Tex-204-F Design of Bituminous Mixtures.

6. TxDOT Tex-207-F Determining Density of Compacted Bituminous Mixtures.

7. TxDOT Tex-208-F Test for Stabilometer Value of Bituminous Mixtures.

8. TxDOT Tex-227-F Theoretical Maximum Specific Gravity of Bituminous Mixtures.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certificates that asphalt materials and aggregates meet requirements of Paragraph 2.1, Materials.

C. Submit proposed mix and test data for each type of base course in Work.

D. Submit manufacturer's description and characteristics of mixing plant for approval.

E. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate:

1. Use crushed gravel or crushed stone or combination retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic or other injurious material occurring either free or as coating on aggregate. Conform aggregate to ASTM C33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed forty percent (40%) by weight when tested in accordance with ASTM C131.

2. Reclaimed asphalt pavement (RAP) or reclaimed Portland cement concrete pavement (RPCCP) are permitted as aggregates for hot-mix asphalt base course if combined aggregate criteria, gradation and mixture properties are met.

B. Fine Aggregate: Sand or stone screenings or combination thereof, passing No. 10 sieve. Conform aggregate to ASTM C33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other deleterious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than six (6) when tested by TxDOT Tex-106-E. Sand equivalent shall have a minimum value of forty-five (45) when tested by TxDOT Tex-203-F.

C. Composite Aggregate: Conform to limits specified in TABLE 4.1 GRADATION OF COMPOSITE AGGREGATE in this Section when graded in accordance with ASTM C136. Provide either coarse or fine aggregate where designated on the Drawings.

D. Asphalt Binder: Moisture-free homogeneous material meeting requirements as specified in TABLE 4.2 ASPHALT BINDERS in this Section.

E. Reclaimed asphalt pavement (RAP) and reclaimed Portland cement concrete pavement (RPCCP) may be used at a rate no greater than twenty percent (20%).

2.2 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception

of a drum mix plant, the plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:

1. Cold aggregate bins and proportioning device.
2. Dryer.
3. Screens.
4. Aggregate weight box and batching scales.
5. Mixer.
6. Asphalt storage and heating devices.
7. Asphalt measuring devices.
8. Truck scales.

C. Bins: Separate aggregate into a minimum of four (4) bins to produce consistently uniform grading and asphalt content in completed mix. One (1) cold feet bin per stockpile is required.

2.3 MIXES

A. Employ certified testing laboratory to prepare design mixes.

1. Test in accordance with TxDOT Tex-126-E, TxDOT Tex-204-F, TxDOT Tex-208-F and TxDOT Tex-227-F.
2. Verify mixture design properties for plant-produced mixture. Demonstrate that asphalt plant is capable of producing mixture meeting design volumetric and stability requirements before placement begins.

B. Density, Stability and Air Voids Requirements: Select asphalt binder content for base courses to result in three percent (3%) to five percent (5%) air voids in laboratory molded specimens, while meeting a minimum VMA requirement for selected mixture classification as specified in TABLE 4.3 MINIMUM VMA REQUIREMENTS in this Section.

PART III: EXECUTION

3.1 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Verify lines and grades are correct.

C. Prepare subgrade in accordance with requirements of Section 02115 Embankment and Section 02135 Excavation for Roadway or Section 02720 Lime-Stabilized Base Subgrade and Section 02725 Portland Cement-Stabilized Base Subgrade. Subgrade preparation may also refer to Section 02145 Cement-Stabilized Sand or Section 02705 Crushed Concrete Base Course.

D. Correct subgrade deviations in excess of plus or minus one-quarter inch (1/4 In) in cross section or in sixteen foot (16 Ft) length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

3.2 PLACEMENT

A. Place base when the surface temperature taken in the shade and away from artificial heat is above forty degrees Fahrenheit (40° F) and rising. Do not place asphalt base when temperature of surface to receive base course is below fifty degrees Fahrenheit (50° F) and falling.

B. Haul prepared and heated asphalt base mixture to project in tight vehicles previously cleaned of foreign material. Mixture shall be at temperature between two hundred fifty degrees Fahrenheit (250° F) and three hundred thirty-five degrees Fahrenheit (325° F) when laid.

C. Place hot-mix asphalt base course in compacted lifts no greater than four inches (4 In) thick, unless permitted by the Project Manager.

D. Place courses as nearly continuously as possible: Place material with approved mechanical spreading and finishing machine of screeding or tamping type. Spread lifts to attain smooth course of uniform density to section, line and grades as indicated on the Drawings.

E. In areas with limited space where use of paver or front-end loader is impractical, spread by hand and compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix; do not broadcast material. Remove lumps that do not break down readily.

3.3 JOINTS

A. Transverse Joints: Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back placed material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

B. Existing pavement: When new asphalt is laid against existing asphalt pavement, saw cut existing asphalt to full depth creating vertical face. Clean joint and apply tack coat before placement.

3.4 COMPACTION

A. Construct test strip to identify correct type, number and sequence of rollers necessary to obtain specified in-place density or air-voids. Prepare test strip at least five hundred feet (500 Ft) in length, comparable to placement and compaction conditions for the Project.

B. Begin rolling while pavement is still hot and as soon as it shall bear roller without undue displacement or hair line cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water; do not use petroleum by-products.

C. Compact surface thoroughly and uniformly with power-driven equipment capable of obtaining required compaction. Ensure subsequent compaction by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half (1/2) width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compaction can be obtained and rolling marks are eliminated. Complete rolling before mat temperature drops below one hundred seventy-five degrees Fahrenheit (175° F).

D. Along walls, curbs, headers, similar structures and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

E. Compact base course to a minimum density of ninety-one percent (91%) (TxDOT Tex-227-F).

3.5 TOLERANCES

A. Furnish templates for checking surface of finished sections. Maximum deflection of templates, when supported at center, shall not exceed one-quarter inch (1/4 In).

B. Completed surface, when tested with a ten foot (10 Ft) straight edge laid parallel to center line of pavement, shall show no deviation in excess of one-quarter inch (1/4 In) in ten feet (10 Ft). Correct surface not meeting this requirement.

3.6 FIELD QUALITY CONTROL

A. Perform testing under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. For in-place depth and density, take a minimum of two (2) cores at random locations for each one thousand feet (1000 Ft) of single lane of pavement. On a two (2) lane pavement, take cores at random every five hundred feet (500 Ft) from alternating lanes. Take cores for parking lots every five hundred square yards (500 Sy) of base to determine in-place depth and density. If cul-de-sac or streets are less than five hundred feet (500 Ft), a minimum of two (2) cores [one (1) per lane] shall be taken. On small projects, take a minimum of two (2) cores for each day's placement. For first days placement and prior to coring, a minimum of five (5) nuclear gauge readings shall be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This process shall continue for each day's placement until the Testing Laboratory's Engineer determines that a good basis has been established for the nuclear gauge.

C. Determine in-place density in accordance with TxDOT Tex-207-F and Tex-227-F from cores or sections of asphaltic base located near each core. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by the Project Manager.

D. Three (3) additional cores within a five foot (5 Ft) radius of core indicating nonconforming in-place depth may be requested by the Project Manager at no additional cost to the City. In-place depth at these locations shall be average depth of four (4) cores.

E. Fill cores and density test sections with new compacted asphalt base or cold patch material.

3.7 NONCONFORMING PAVEMENT

A. Re-compact and retest nonconforming street sections not meeting surface test requirements. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute. Retesting

is at no cost to the City.

B. Remove and replace areas of asphalt base found deficient in thickness by more than ten percent (10%). Remove and replace areas of asphalt base found deficient in density. Use new asphalt base of thickness shown on the Drawings.

C. Replace or correct nonconforming pavement sections at no additional cost to the City.

3.8 PROTECTION

A. Do not open base to traffic until at least twelve hours (12 Hrs) after completion of rolling or as noted on the Drawings.

B. Maintain asphalt base in good condition until completion of the Work.

C. Repair defects immediately by replacing base to full depth.

PART IV: TABLES

4.1 GRADATION OF COMPOSITE AGGREGATE

GRADATION OF COMPOSITE AGGREGATE Percent Passing by Weight or Volume		
Sieve Size	Type A Coarse Base	Type B Fine Base
1 1/2□	100	-
1 1/4□	95 to 100	-
1□	-	100
7/8□	70 to 90	95 to 100
5/8□	-	75 to 95
1/2□	50 to 70	-
3/8□	-	60 to 80
#4	30 to 50	40 to 60
#10	30 to 34	27 to 40
#40	5 to 20	10 to 25
#80	2 to 12	3 to 13
#200	1 to 6*	1 to 6*
VMA % Minimum	11	12
*2 to 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.		

4.2 ASPHALT BINDERS

SPECIFICATION	PG 64 □22
Average 7-day Maximum Pavement Design Temperature, degrees C[a]	<64
Minimum Pavement Design Temperature, degrees C [a]	>-22
Original Binder	
Flash Point Temperature, T48, Minimum degrees C	230
Viscocity, ASTM D4402, [b] Maximum 3 Pa.s (3000cP), Test Temperature, degrees C	135
Dynamic Shear, TP5, [c] G*/sine[], Minimum, 1.00kPa Test Temperature @ 10rad/sec, degrees C	64
Rolling Thin Film Oven (T240) or Thin Film Oven (T179) Residue	
Mass Loss, Maximum, %	-1.00
Dynamic Shear T5; G*sine[], Minimum, 2.20 kPa Test Temperature @ 10 rad/sec, degrees C	64
Pressure Aging Vessel Residue (PPI)	
PAV Aging Temperature, degrees C [d]	100
Dynamic Shear, TP5; G*/sine[], Maximum 5000 kPa Test Temperature @ 10 rad/sec, degrees C	25
Physical Hardening [e]	Report
Creep Stiffness, TP1; [f] S, Maximum, 300 Mpa; m-value, Minimum, 0.300 Test Temperature @ 60 sec, degrees C	-12
Direct Tension, TP3; [f] Failure Strain, Minimum, 1.0%; Test Temperature @ 1.0 mm/min, degrees C	-12

NOTES:

a Pavement temperature can be estimated from air temperature using algorithm contained in TxDOT testing procedures.

b The requirement may be waived at the discretion of the Project Manager if supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet the applicable safety standards.

C For quality control of unmodified asphalt cement production, measurement of viscosity of original asphalt cement may be substituted for dynamic shear measurements of G*/sine[] at test temperature where asphalt is Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary of rotational viscometry (AASHTO T 201 or T 202).

[d] The PAV aging temperature is based on simulated climatic conditions and is one of three (3) temperatures: ninety Centigrade (90° C), one hundred degrees Centigrade (100° C) or one hundred ten degrees Centigrade (110° C). The PAV aging temperature is one hundred degrees Centigrade (100° C) for PG64 and PG70.

[e] Physical Hardening TP 1 is performed on a set of asphalt beams according to Section 13.1, except conditioning time is extended to twenty-four hours (24 Hrs) plus or minus ten minutes (±10 Min) at ten degrees Centigrade (10° C) above minimum performance temperature. The twenty-four hour (24 Hr) stiffness and m-value are reported for information purposes only.

[f] If creep stiffness is below three hundred Mega Paschals (300 MPa), the direct tension test is not required. If creep stiffness is between three hundred Mega Paschals (300 Mpa) and six hundred Mega Paschals (600 MPa) the direct tension failure strain requirement can be used in lieu of creep stiffness requirement. The m-value requirement must be satisfied in both cases.

4.3 MINIMUM VMA REQUIREMENTS

Percent Density		Percent Optimum	HVEEM Stability Percent Not Less Than	Percent Asphalt Content	
Min.	Max.			Min.	Max.
94.5	97.5	96	35	3.5	7

END OF SECTION

SECTION 02720

LIME-STABILIZED BASE SUBGRADE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Foundation course of lime-stabilized subgrade material.

1. Application of lime slurry to subgrade.

2. Mixing, compaction and curing of lime slurry, water and subgrade into a stabilized foundation.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Measurement and payment for lime-stabilized subgrade is on a square yard basis compacted in place to proper density. Separate measurement shall be made for each required thickness of subgrade course.

a. Limits of measurement shall be actual pavement replaced, but not beyond the maximum pavement replacement limits shown on the Drawings. Limits for measurement shall be extended to include installed lime-stabilized subgrade material that extends two feet (2 Ft) beyond outside edge of pavement to be replaced, except where proposed pavement section shares common longitudinal or transverse edge with existing pavement section. No payment shall be made for lime-stabilized subgrade in areas beyond these limits.

b. Limits of measurement and payment shall match pavement replacement limits shown on the Drawings, except as noted in Paragraph 1.2.A.1.a or as approved by the Project Manager.

2. Measurement and payment for lime is by ton of two thousand pounds (2000 Lbs) dry weight basis. Calculate weight of dry solids for lime slurry based on percentage by dry weight solids.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 DEFINITION

A. Moist Cure: Curing soil and lime to obtain optimum hydration.

B. One Thousand Foot (1000 Ft) Roadway Section: One thousand feet (1000 Ft) per lane width or approximately five hundred square yards (500 Sy) of compacted subgrade for other than full-lane-width roadway sections.

1.4 REFERENCES

A. ASTM □ American Society for Testing and Materials

1. ASTM D698 □ Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3).

2. ASTM D2922 □ Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

3. ASTM D4318 □ Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01470 □ Testing Laboratory Services.

4. Section 01475 □ Quality Control Testing Procedures.

C. TxDOT □ Texas Department of Transportation.

1. TxDOT Tex-101-E (Part III) □ Preparation of Soil and Flexible Base Material for Testing. TxDOT Tex-140-E □ Measuring Thickness of Pavement Layer.

2. TxDOT Tex-600-J Sampling and Testing Hydrated Lime, Quicklime and Commercial Lime Slurry.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certification that hydrated lime, quicklime or commercial lime slurry complies with the specifications.

C. Submit weight tickets, certified by supplier, with each bulk delivery of lime to work site.

1.6 DELIVERY, STORAGE AND HANDLING

A. Bagged lime shall bear manufacturer s name, product identification and certified weight. Bags varying more than five percent (5%) of certified weight may be rejected; average weight of fifty (50) random bags in each shipment shall not be less than certified weight.

B. Store lime in weatherproof enclosures. Protect lime from ground dampness.

1.7 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that material was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 WATER

A. Use clean, clear water, free from oil, acids, alkali or vegetation.

2.2 LIME

A. Type A Hydrated Lime: Dry material consisting essentially of calcium hydroxide or mixture of calcium hydroxide and an allowable percentage of calcium oxide as listed in chemical composition chart.

B. Type B Commercial Lime Slurry: Liquid mixture consisting essentially of lime solids and water in slurry form. Water or liquid portion shall not contain dissolved material in sufficient quantity to be injurious or objectionable for purpose intended.

C. Type C Quicklime: Dry material consisting essentially of calcium oxide. Furnish quicklime in either of the following grades:

1. Grade DS: Pebble quicklime of gradation suitable for use in preparation of slurry for wet placing.

2. Grade S: Finely-graded quicklime for use in preparation of slurry for wet placing. Do not use grade S quicklime for dry placing if dry placing is permitted.

D. Conform to the requirements in Table 4.1 QUICKLIME PROPERTY SPECIFICATIONS in this Section.

E. Deliver lime slurry to job site as commercial lime or prepare at job site by using hydrated lime or quicklime. Provide slurry free of liquids other than water and of consistency that can be handled and uniformly applied without difficulty.

F. Lime containing magnesium hydroxide is prohibited.

G. Lime containing fly ash is prohibited.

2.3 SOIL

A. Soil to receive lime treatment may include borrow or existing subgrade material, existing pavement structure or combination of all three (3). Where existing pavement or base material is encountered, pulverized or scarify material so that one hundred percent (100%) of sampled material passes two inch (2 In) sieve.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade shall support imposed loads.

B. Verify subgrade lines and grades.

3.2 PREPARATION

A. Complete backfill of utilities prior to stabilization.

B. Cut material to bottom of subgrade using an approved cutting and pulverizing machine meeting following requirements:

1. Cutters accurately provide smooth surface over entire width of

cut to plane of secondary grade.

2. Provide cut to depth as specified or shown in the Drawings.

C. Alternatively, scarify or excavate to bottom of stabilized subgrade. Remove material or windrow to expose secondary grade. Obtain uniform stability.

D. Correct wet or unstable material below secondary grade by scarifying, adding lime and compacting as directed by the Project Manager.

E. Pulverize existing material so that one hundred percent (100%) passes a one and three-quarters inch (1-3/4 In) sieve.

3.3 LIME SLURRY APPLICATION

A. Apply slurry with distributor truck equipped with an agitator to keep lime and water in consistent mixture. Make successive passes over measured section of roadway to attain proper moisture and lime content. Limit spreading to an area where preliminary mixing operations can be completed on same working day.

B. Minimum lime content shall be six percent (6%) of dry unit weight of subgrade as determined by ASTM D698.

3.4 PRELIMINARY MIXING

A. Use approved single-pass or multiple-pass rotary speed mixers to mix soil, lime and water to required depth. Ensure homogeneous friable mixture free of clods and lumps.

B. Shape mixed subgrade to final lines and grades.

C. Eliminate following operations and final mixing if pulverization requirements of Paragraph 3.5.C can be met during preliminary mixing:

1. Seal subgrade as precaution against heavy rainfall by rolling lightly with light pneumatic rollers.

2. Cure soil lime material for twenty-four hours (24 Hrs) to seventy-two hours (72 Hrs) or as required to obtain optimum hydration. Keep subgrade moist during cure.

3.5 FINAL MIXING

A. Use approved single-pass or multiple-pass rotary speed mixers to

uniformly mix cured soil and lime to required depth.

B. Add water to bring moisture content of soil mixture to optimum or above.

C. Mix and pulverize until all material passes one and three-quarters inch sieve (1-3/4 In); a minimum of eighty-five percent (85%), excluding non-slacking fractions, passes three-quarters inch (3/4 In) sieve; and a minimum of sixty percent (60%) excluding non-slacking fractions passes No. 4 sieve. Test according to TxDOT Tex-101-E, Part III using dry method. Sieve analysis shall conform to the requirements of TABLE 4.2 LIME-STABILIZED SUBRADE SIEVE ANALYSIS in this Section.

D. Shape mixed subgrade to final lines and grades.

E. Do not expose hydrated lime to open air for six hours (6 Hrs) or more during interval between application and mixing. Avoid excessive hydrated lime loss due to washing or blowing.

3.6 COMPACTION

A. Aerate or sprinkle to attain optimum moisture content to three percent (3%) above optimum, as determined by ASTM D698 on material sample from roadway after final mix with lime.

B. Start compaction immediately after final mixing.

C. Spread and compact in two (2) or more equal layers where total compacted thickness is greater than equipment manufacturer's recommended range of mixing and compaction.

D. Compact with approved heavy pneumatic or vibrating rollers or combination of tamping rollers and light pneumatic rollers. Begin compaction at bottom and continue until entire depth is uniformly compacted.

E. Do not allow stabilized subgrade to mix with underlying material. Correct irregularities or weak spots immediately by replacing material and re-compacting.

F. Compact subgrade to a minimum density of ninety-five percent (95%) of a maximum dry density, according to ASTM D698, at moisture content of optimum to three percent (3%) above optimum, unless otherwise indicated on the Drawings.

G. Seal with approved light pneumatic tired rollers. Prevent surface hair line cracking. Rework and recompact at areas where hairline cracking develops.

3.7 CURING

A. Moist cure for a minimum of three days (3 D) before placing base or surface course or opening to traffic. Subgrade may be opened to traffic after two days (2 D) when adequate strength has been attained to prevent damage. Restrict traffic to light pneumatic rollers or vehicles weighing less than ten tons (10 Tn).

B. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.

C. Place base or surface within fourteen days (14 D) after final mixing and compaction. Restart compaction and moisture content of base material when time is exceeded.

3.8 TOLERANCES

A. Completed surface: smooth and conforming to typical section and established lines and grades.

B. Top of compacted surface: Plus or minus one-quarter inch (±1/4 In) in cross section or in sixteen feet (16 Ft) of length.

C. Depth of lime stabilization shall be a minimum specified depth for each one thousand foot (1000 Ft) roadway section, unless otherwise noted on the Drawings.

3.9 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Test soils, lime and mixtures as follows:

1. Tests and analysis of soil materials shall be performed in accordance with ASTM D4318, using the wet preparation method.

2. Sampling and testing of lime slurry shall be in accordance with TxDOT Tex-600-J, except using a lime slurry cup.

3. Sample mixtures of hydrated lime or quicklime in slurry form shall be tested to establish compliance with the specifications.

4. Moisture-density relationship shall be established on material sampled from roadway, after stabilization with lime and final mixing, in accordance with ASTM D698, Moist preparation Method.

C. In-place depth shall be evaluated for each one thousand foot (1000 Ft) roadway section and determined in accordance with TxDOT Tex-140-E in hand excavated holes. For each one thousand foot (1000 Ft) section, three (3) phenolphthalein tests shall be performed. Average stabilization depth for one thousand foot (1000 Ft) section shall be based on average depth for three (3) tests.

D. Perform compaction testing in accordance with ASTM D2922. Three (3) tests shall be performed for each one thousand foot (1000 Ft) roadway section.

E. Pulverization analysis shall be performed as required by Paragraph 3.5.C on material sampled during mixing of each production area. Three (3) tests shall be performed per six hundred foot (600 Ft) roadway section or a minimum one (1) for each day of production.

3.10 REWORK OF FAILED SECTIONS

A. Rework sections that do not meet specified thickness.

B. Perform the following steps when more than seventy-two hours (72 Hrs) have lapsed since completion of compaction:

1. Moist cure for a minimum of three days (3 D) after compaction to required density.

2. Add lime at rate of twenty-five percent (25%) of specified rate at no additional cost to the City.

3. Moisture density test of reworked material must be completed by laboratory before field compaction testing can be completed.

3.11 PROTECTION

A. Maintain stabilized subgrade to lines and grades and in good condition until placement of base or surface course. Protect asphalt membrane from being picked up by traffic.

B. Repair defects immediately by replacing material to full depth.

PART IV: TABLES

4.1 QUICKLIME PROPERTY SPECIFICATIONS

CHEMICAL COMPOSITION	TYPE		
	A	B	C
Active lime content, % by weight Ca(OH)+CaO	90.0 min.[1]	87.0 min.[2]	- -
Unhydrated lime content, % by weight CaO	5.0 max.	- -	87.0 min.
Free water content, % by weight H_2O	5.0 max.	- -	- -
SIZING			
Wet Sieve, as % by weight residue retained:			
No. 6	0.2 max.	0.2 max.[2]	8.0 max.[3]
No. 30	4.0 max.	4.0 max.[2]	- -
Dry Sieve, as % by weight residue retained:			
1-inch	- -	- -	0.0
1/2-inch	- -	- -	10.0 max.

NOTES:
1. Maximum five percent (5%) by weight CaO shall be allowed in determining total active lime content.
2. Maximum solids content of slurry.
3. Total active lime content, as CaO, in material retained on No. 6 sieve shall not exceed two percent (2%) by weight of original Type C Lime.

4.2 LIME-STABILIZED SUBRADE SIEVE ANALYSIS

SIEVE SIZE	PERCENT PASSING
1 3/4 Sieve	100%
3/4" Sieve	85%
Number 4 Sieve	60%

END OF SECTION

SECTION 02725

PORTLAND CEMENT-STABILIZED BASE SUBGRADE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Foundation course of Portland cement-stabilized natural subgrade material.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Portland cement-stabilized subgrade is on a square yard basis compacted in place to proper density. Separate measurement shall be made for each different required thickness of subgrade course.

   a. Limits of measurement shall be actual pavement replaced, but not beyond the maximum pavement replacement limits shown on the Drawings. Limits for measurement shall be extended to include installed Portland cement-stabilized subgrade material that extends two foot (2 Ft) beyond outside edge of pavement to be replaced except where proposed pavement section shares common longitudinal or transverse edge with existing pavement section. No separate payment shall be made for Portland cement-stabilized subgrade beyond these limits.

   b. Limits of measurement and payment shall match pavement replacement limits shown on the Drawings, except as noted in Paragraph 1.2.A.1.a or as approved by the Project Manager.

2. Payment for Portland cement is by the ton of two thousand pounds (2000 Lbs) dry-weight basis.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulate Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C150 Standard Specification for Portland Cement.

2. ASTM D558 Standard Test Method for Moisture-Density Relations of Soil-Cement-Mixtures.

3. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12.44ft-lbf/ft_3).

4. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

5. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certification that Portland cement complies with these Technical Specifications.

PART II: PRODUCTS

2.1 WATER

A. Water: clean, clear and free from oil, acids, alkali or organic matter.

2.2 PORTLAND CEMENT

A. ASTM C150 Type I; bulk or sacked.

2.3 SOIL

A. Provide soil consisting of approved material free from vegetation or other objectionable matter encountered in existing roadbed.

2.4 TESTS

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Tests and analysis of soil materials shall be performed in accordance with ASTM D4318.

C. Soil shall be evaluated to establish ratio of cement to soil to obtain desired stability. Normal range is six percent (6%) to ten percent (10%) by weight.

D. The percentage of moisture in soil, at tome of cement applications, shall be determined by ASTM D558. Moisture shall not be allowed to exceed quantity that shall permit uniform, complete mixture of soil and cement during dry mixing operations nor specified optimum moisture content for soil cement mixture, as determined.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify subgrade lines and grades are correct.

3.2 EQUIPMENT

A. Apply Portland cement treatment with machine or combination of machines and auxiliary equipment to produce specified results. Mixing may be accomplished by multi-pass traveling mixing plant or single-pass traveling mixing plant. Provide sufficient equipment to enable continuous prosecution of work.

3.3 PREPARATION

A. Backfill for utilities below future grade.

B. Verify subgrade is firm and able to support, without displacement, construction equipment at specified density. Correct soft or yielding subgrade and stabilize by scarifying and aerating or by adding cement and compacting to uniform stability.

C. Grade, shape and compact, as required, to allow construction of Portland cement treatment for in-place materials to lines, grades, thickness and typical cross section on the Drawings. Remove unsuitable soil or material and replace with acceptable material.

D. Pulverize soil so that at completion of moist-mixing, one hundred percent (100%) by dry weight passes one inch (1 In) sieve and a minimum of eighty percent (80%) passes a No. 4 sieve, exclusive of gravel or stone retained on these sieves. Pulverize existing bituminous wearing surfaces so that one hundred percent (100 %) shall pass two inch (2 In) sieve.

3.4 MIXING

A. Do not place and mix cement when the ambient temperature is below forty degrees Fahrenheit (40° F) and falling. Place base when ambient temperature when taken in the shade and away from artificial heat is above thirty-five degrees Fahrenheit (35° F) and rising.

B. Spread cement uniformly on soil at rate specified by laboratory. When bulk cement spreader is used, position it by string lines or other approved method to ensure uniform distribution of cement. Apply cement only in area where operations can be continuous and completed in daylight, within one hour (1 Hr) of application. Amount of moisture in soil at time of cement placement shall not exceed quantity that shall permit uniform mixture of soil and cement during dry mixing operations. Do not exceed specified optimum moisture content for soil-cement mixture.

C. Do not allow equipment other than that used in spreading and mixing, to pass over freshly spread cement until it is mixed with soil.

D. Dry mix cement with soil after cement application. Continue mixing until cement has been sufficiently blended with soil to prevent formation of cement balls when water is applied. Mixture of soil and cement that has not been compacted and finished shall not remain undisturbed for more than thirty minutes (30 Min).

E. Immediately after dry mixing is complete, uniformly apply water as necessary and incorporate it into mixture. Pressurized equipment must provide adequate supply to ensure continuous application of required amount of water to sections being processed within three hours (3 Hrs) of cement application. Ensure proper moisture distribution at all times. After last increment of water has been added, continue mixing until thorough and uniform mix has been obtained.

F. Ensure percentage of moisture in mixture, based on dry weights, is within two (2) percentage points of specified optimum moisture content prior to compaction. When un-compacted soil-cement mixture is wetted by rain indicating that average moisture content exceeds tolerance given at the time of final compaction, reconstruct entire section in accordance with this Section at no additional cost to the City.

3.5 COMPACTION

A. Prior to beginning compaction, ensure mixture is in loose condition for its full depth. Uniformly compact the loose mixture to specified density, lines and grades.

B. After soil and cement mixture is compacted, apply water uniformly as needed and mix thoroughly. Reshape surface to required lines, grades and cross section and lightly scarify to loosen imprints left by compacting or shaping equipment.

C. Roll resulting surface with pneumatic-tired roller and skin surface with power grader. Thoroughly compact mixture with pneumatic roller, adding small increments of moisture, as needed. When aggregate larger than No. 4 sieve is present in mixture, make one (1) complete coverage of section with flat-wheel roller immediately after skinning operation. When approved by the Project Manager, surface finishing methods may be varied from this procedure, provided dense uniform surface, free of surface compaction planes, is produced. Maintain moisture content of surface material at its specified optimum during finishing operations. Compact and finish surface within a period not to exceed two hours (2 Hrs), to produce smooth, tight surface, free of cracks, ridges or loose material, conforming to crown, grade and line shown on the Drawings within the period not to exceed two hours (2 Hrs).

3.6 CONSTRUCTION JOINTS

A. At end of each day's construction, form straight transverse construction joint by cutting back a total width of completed work to form true two

inch (2 In) depth of vertical face free of loose and shattered material. Construct cement treatment for large wide areas in series of parallel lanes of convenient length and width approved in advance by the Project Manager.

3.7 CURING

A. Moist cure for a minimum of three days (3 D) before placing base or surface course or opening to traffic. When open, restrict traffic to light pneumatic rollers or vehicles weighing less than ten tons (10 Tn).

B. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.

C. Place base and surface within fourteen days (14 D) after the final mixing and compaction, unless prior approval is obtained by the Project Manager.

3.8 TOLERANCES

A. Completed surface: smooth and conforming to typical section and established lines and grades.

B. Top of compacted surface: Plus or minus one-quarter inch (±1/4 In) in cross section or in sixteen feet (16 Ft) of length.

3.9 FIELD QUALITY CONTROL

A. Testing shall be performed under provision of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. In-place density shall be determined in accordance with ASTM D2922 or ASTM D698. A minimum of three (3) tests shall be taken for each one thousand feet (1000 Ft) per lane of roadway or five hundred square yards (500 Sy) of embankment.

3.10 PROTECTION

A. Maintain stabilized subgrade to lines and grades and in good condition until placement of base or surface course.

B. Repair defects immediately by replacing material to full depth.

END OF SECTION

SECTION 02730

PRIME COAT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Prime coat for asphalt concrete paving

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for prime coat under this Section. Include payment in unit price for material being primed.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 □ Submittal Procedures.

B. Submit product data for proposed prime coat.

C. Submit report of recent calibration of distributor.

1.4 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

1.5 QUALITY ASSURANCE

A. Provide manufacturer□s affidavits that material was manufactured in

compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 CUTBACK ASPHALT

A. Provide moisture-free homogeneous material which shall not foam when heated to three hundred forty seven degrees Fahrenheit (347° F) and which meets the following requirements:

B. Asphalt material for prime coat shall be MC-30 or MC-70 and shall meet requirements as specified in TABLE 4.1 ASPHALT MATERIAL FOR PRIME COAT in this Section:

1. Distillate shall be as specified in TABLE 4.2 DISTILLATE in this Section, expressed as percent by volume of total distillate to six hundred eighty degrees Fahrenheit (680° F).

2. Tests on Distillation Residue shall be as specified in TABLE 4.3 DISTILLATE TEST in this Section.

2.2 EMULSIFIED PETROLEUM RESIN

A. EPR-1 Prime: Slow curing emulsion of petroleum resin and asphalt cement conforming to requirements as specified in TABLE 4.4 EMULSIFIED PERTROLEUM RESIN PROPERTIES in this Section.

B. For use, EPR-1 may be diluted with water up to a maximum three (3) parts water to one (1) part EPR- 1 in order to achieve desired concentration of residual resin/asphalt to facilitate application.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify base is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Thoroughly clean base course surface of loose material by hand brooming or mechanical sweeping prior to application of tack coat.

B. Prepare sufficient base in advance of paving for efficient operations.

3.3 APPLICATION, BASIC

A. Apply prime coat with approved type of self-propelled pressure distributor. Distribute prime coat evenly and smoothly under pressure necessary for proper distribution.

B. Keep storage tanks, piping, retorts, booster tanks and distributors used in handling asphalt materials clean and in good operating condition. Conduct operations so asphalt material does not become contaminated.

C. If yield of asphaltic material appears to be in error, recalibrate distributor prior to continuing the Work.

D. Maintain surface until the Work is accepted by the City.

3.4 APPLICATION, CUTBACK ASPHALT

A. Do not use cutback asphalt during period of April 16th through September 15th.

B. Do not place prime coat when air temperature is below sixty degrees Fahrenheit (60° F) and falling. Materials may be placed when air temperature taken in shade and away from artificial heat is above fifty degrees Fahrenheit (50° F) and rising.

C. Distribute at rate of twenty-five hundredths gallons per square yard (0.25 Gal/Sy) to thirty five hundredths gallons per square yard (0.35 Gal/Sy).

D. Equipment shall accurately determine temperature of asphaltic material in heating equipment and in distributor, for determining rate of application and for obtaining uniformity at junction of two (2) distributor loads. Maintain in accurate working order, including recording thermometer at storage heating unit.

E. Base temperature of application on temperature-viscosity relationship that shall permit application of asphalt with viscosity of one hundred centistokes (100 cSt) to one hundred twenty-five centistokes (125 cSt). Maintain asphalt within fifteen degrees Fahrenheit (15° F) of temperature required to meet viscosity. Selected temperature shall be within range specified in TABLE 4.5 TEMPERATURES FOR VISCOSITY in this Section.

F. Do not allow temperature of MC-30 to exceed one hundred seventy-five

degrees Fahrenheit (175° F).

G. Do not allow temperature of MC-70 to exceed two hundred degrees Fahrenheit (200° F).

3.5 APPLICATION, EMULSIFIED PETROLEUM RESIN

A. Do not place prime coat when air temperature is below thirty-six degrees Fahrenheit (36° F) and falling.

B. Distribute at rate of fifteen hundredths gallons per square yard (0.15 Gal/Sy) to twenty-five hundredths gallons per square yard (0.25 Gal/Sy).

3.6 PROTECTION

A. Do not allow traffic on or placement of subsequent base or surface courses over freshly applied prime coat until authorized by the Project Manager.

PART IV: TABLES

4.1 ASPHALT MATERIAL FOR PRIME COAT

PROPERTIES	**TYPE GRADE**			
	MC 30		**MC 70**	
	MIN.	**MAX.**	**MIN.**	**MAX.**
Water, Percent	-	0.2	-	0.2
Flash Point, T.O.C., °F	100	-	100	-
Kinematic Viscosity at 140° F, cst	30	60	70	140

4.2 DISTILLATE

TEMPERATURE	**TYPE GRADE**			
	MC 30		**MC 70**	
	MIN.	**MAX.**	**MIN.**	**MAX.**
to 437° F	-	25	-	20
to 500° F	40	70	20	60
to 600° F	75	93	65	90
Residue from 680° F Distillation, Volume, Percent	50	-	55	-

4.3 DISTILLATE TEST

TEST	TYPE □ GRADE			
	MC □ 30		MC □ 70	
	MIN.	MAX.	MIN.	MAX.
Penetration at 77° F, 100g, 5 sec.	120	250	120	250
Ductility at 77° F, 5 cm/min. cms	100*	-	100*	-
Solubility in Trichloroethylene, %	99	-	99	-
Spot Test	All Negative			

* If penetration of residue is more than two hundred (200) and ductility at seventy-seven degrees Fahrenheit (77° F) is less than one hundred centimeters (100 Cm), material shall be acceptable when its ductility is sixty degrees Fahrenheit (60° F) is more than one hundred centimeters (100 Cm).

4.4 EMULSIFIED PERTROLEUM RESIN PROPERTIES

PROPERTIES	MIN.	MAX.
Fural Viscosity at 77° F, Sec	14	40
Residue by Evaporation, % by Weight	60	-
Sieve Test, %	-	0.1
Particle Charge Test	Positive	
Tests on Distillation Residue:		
Flash Point, COC (F)	400	-
Kinematic Viscosity @ 140° F (cst)	190	350

4.5 TEMPERATURES FOR VISCOSITY

PRIME COAT TYPE	MINIMUM °F	MAXIMUM °F
MC □ 30	70	150
MC □ 70	125	175

END OF SECTION

SECTION 02735

TACK COAT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Tack coat for asphalt concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for tack coat under this Section. Include payment in unit price for asphaltic pavements.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM D244 Standard Test Methods for Emulsified Asphalts.

B. CFTS City of Friendswood Technical Specifications

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit product data for proposed tack coat.

C. Submit report of recent calibration of distributor.

1.5 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that material was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 EMULSION

A. Provide homogeneous material which shows no separation of asphalt after mixing and meets viscosity requirements within thirty days (30 D) after delivery.

B. Emulsion material for tack coat.

1. Emulsified asphalt: SS-1 or SS-1H meeting criteria listed in Table 4.1 – PROPERTIES OF EMULSIFIED ASPHALT SS-1 OR SS-1H in this Section.

2. Polymer Modified Emulsion, SS-1P, for use where thin overlays [less than or equal two inches (2 In)] are placed on collector or arterial streets and for speed humps, especially over existing Portland cement concrete pavement, meeting criteria listed in Table 4.2 – PROPERTIES OF POLYMER MODIFIED EMULSION SS – 1P in this Section.

3. For emulsions used for tack coats during period of April 16th through September 15th, volatile organic compound solvents (VOC) shall not exceed twelve percent (12%) by weight when tested in accordance with ASTM D244.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted base is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Thoroughly clean base course or concrete surface of loose material by hand brooming or mechanical sweeping prior to tack coat application.

3.3 APPLICATION

A. Apply tack coat uniformly by use of approved distributor at rate not to exceed five hundredths gallons per square yard (0.05 Gal/Sy) of surface depending on texture of underlying surface. Select an application rate that shall provide appropriate asphalt residual.

B. Paint contact surfaces of curbs, structures and joints with thin uniform coat of tack coat.

3.4 PROTECTION

A. Prevent traffic or placement of subsequent courses over freshly applied tack coat until authorized by the Project Manager.

PART IV: TABLES

4.1 PROPERTIES OF EMULSIFIED ASPHALT SS-1 OR SS-1H

PROPERTIES	**SS □1**		**SS □1H**	
	MIN.	**MAX.**	**MIN.**	**MAX.**
Furol Viscosity at 77° F, sec.	20	100	20	100
Residue by Distillation, %	60	---	60	---
Oil Portion of Distillate, %	---	1/2	---	1/2
Sieve Test, %	---	0.10	---	0.10
Miscibility (Standard Test)	Passing			
Cement Mixing, %	---	2.0	---	2.0
Storage Stability, 1 Day, %	---	1	---	1
Test on Residue:				
Penetration at 77° F, 100g, 5 sec.	120	160	70	100
Solubility in Trichloroethylene, %	97.5	---	97.5	---
Ductibility at 77° F, 5 cm/min., cms	100	---	100	---

4.2 PROPERTIES OF POLYMER MODIFIED EMULSION SS □1P

PROPERTIES	SS □1P	
	MIN.	MAX.
Furol Viscosity at 77° F, sec.	30	100
Residue by Distillation, %	60	---
Oil Portion of Distillate, %	---	1/2
Sieve Test, %	---	0.10
Miscibility (Standard Test)	Passing	
Cement Mixing, %	---	2.0
Storage Stability, 1 Day, %	---	1
Test on Residue:		
Penetration at 77° F, 100g, 5 sec.	100	140
Solubility in Trichloroethylene, %	97.0	---
Ductibility at 77° F, 5 cm/min., cms	50	---
Viscosity at 140° F, poises	1300	---

END OF SECTION

SECTION 02800

ASPHALTIC CONCRETE PAVEMENT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Surface course of compacted mixture of coarse and fine aggregates and asphaltic binder.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for hot-mix asphaltic concrete pavement is on a per ton basis. Separate pay items are used for each different required thickness of pavement.

2. Payment for hot-mix asphaltic concrete pavement includes payment for associated work performed in accordance with Section 02735 Tack Coat.

3. Measurement for utility projects: Match actual pavement replaced but no greater than a maximum pavement replacement limits shown on the Drawings.

4. Measurement for utility projects:

   a. Actual pavement replaced but not beyond the maximum pavement replacement limits shown on the Drawings.

   b. Include installed hot-mix asphaltic base course material that extends one foot (1 Ft) beyond outside edge of pavement to be replaced, except where proposed pavement section shares common edge with existing pavement section.

5. Payment for speed humps is on linear foot basis and includes milling of existing pavement, tack coat and placement and compaction of asphalt. Measurement of speed hump is along length of twelve foot (12 Ft) wide speed hump, measured transverse to centerline of road. Separate payment is made for thermoplastic markings applied to speed hump.

6. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM – American Standards for Testing and Materials.

1. ASTM C33 – Standard Specification for Concrete Aggregates.

2. ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02700 – Cement-Stabilized Base Course.

4. Section 02705 – Crushed Concrete Base Course.

5. Section 02715 – Hot-Mix Asphaltic Base Course.

6. Section 02735 – Tack Coat.

7. Section 02845 – Pavement Repair and Resurfacing.

8. Section 02860 – Thermoplastic Pavement Markings.

C. TxDOT – Texas Department of Transportation.

1. TxDOT Tex-106-E – Calculating the Plasticity Index of Soils

2. TxDOT Tex-126-E – Molding, Testing and Evaluating Bituminous Black Base Material.

3. TxDOT Tex-200-F – Sieve Analysis of Fine and Course Aggregates.

4. TxDOT Tex-203-F Sand Equivalent Test.

5. TxDOT Tex-204-F Design of Bituminous Mixtures.

6. TxDOT Tex-206-F Compacting Test Specimens of Bituminous Mixtures.

7. TxDOT Tex-207-F Determining Density of Compacted Bituminous Mixtures.

8. TxDOT Tex-208-F Test for Stabilometer Value of Bituminous Mixtures.

9. TxDOT Tex-217-F Determining Deleterious Material and Decantation Test for Coarse Aggregates.

10. TxDOT Tex-227-F Theoretical Maximum Specific Gravity of Bituminous Mixtures.

11. TxDOT Tex-530-C Effect of Water on Bituminous Paving Mixtures.

12. TxDOT Tex-531-C Prediction of Moisture Induced Damage to Bituminous Paving Materials Using Molded Specimens.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certificates that asphalt materials and aggregates meet requirements of Paragraph 2.1 Materials.

C. Submit proposed design mix and test data for surface course.

D. Submit manufacturer s description and characteristics of spreading and finishing machine for approval.

PART II: PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate:

1. Use gravel, crushed stone or combination thereof that is retained on No. 10 sieve, uniform in quality throughout and free

from dirt, organic or other injurious matter occurring either free or as coating on aggregate. Use aggregate conforming to ASTM C33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed forty percent (40%) by weight when tested in accordance with ASTM C131.

2. Aggregate by weight shall not contain more than one percent (1%) by weight of fine dust, claylike particles or silt when tested in accordance with Tex-217-F, Part II.

B. Fine Aggregate: Sand, stone screenings or combination of both passing No. 10 sieve. Use aggregate conforming to ASTM C33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other injurious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than six (6) when tested by TxDOT Tex-106-E. Sand equivalent shall have a minimum value of forty-five (45) when tested by TxDOT Tex-203-F.

C. Composite Aggregate: Conform to limits when graded in accordance with TxDOT Tex-200-F as specified in TABLE 4.1 GRADATION OF COMPOSITE AGGREGATE in this Section. Use type specified on the Drawings.

D. Asphalt Binder: Moisture-free homogeneous material which shall not foam when heated to three hundred forty-seven degrees Fahrenheit (347° F), meeting the requirements specified in TABLE 4.2 PERFORMANCE GRADED BINDERS in this Section.

E. Anti-stripping Agent:

1. Evaluate mixture of aggregate, asphalt and additives proposed for use for moisture susceptibility and requirement for anti-stripping agents. To substantiate mix design, produce and test trial mixtures using proposed project materials and equipment prior to placement. Test for susceptibility to moisture and trial mixture may be waived by the Project Manager when similar designs using same material have previously proven satisfactory.

2. Liquid Anti-stripping Agent: Use anti-stripping agent with uniform liquid with no evidence of crystallization, settling or separation of components. Submit sample of antistripping agent proposed for use and manufacturer's product data, including recommended dosage range, handling and storage

and application instructions.

F. Pavement markings for speed humps: Conform to requirements of Section 02860 Thermoplastic Pavement Markings.

2.2 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception of a drum mix plant, plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:

1. Cold aggregate bins and proportioning device.
2. Dryer.
3. Screens.
4. Aggregate weight box and batching scales.
5. Mixer.
6. Asphalt storage and heating devices.
7. Asphalt measuring devices.
8. Truck scales.

B. Bins: Separate aggregate into a minimum of four (4) bins to produce consistently uniform grading and asphalt content in completed mix. Provide one (1) cold feed bin per stockpile.

2.3 MIXES

A. Employ certified testing laboratory to prepare design mixes. Test in accordance with TxDOT Tex-126-E or Tex-204-F, Tex-206-F, Tex-208-F, Tex-530-C and Tex-531-C.

B. Density, Stability and Air Void Requirements as stated in TABLE 4.3 DENSITY, STABILITY AND AIR VOID REQUIREMENTS in this Section.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted base course is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Prepare subgrade in accordance with requirements of Section 02700 Cement-Stabilized Base Course, Section 02705 Crushed Concrete Base Course or Section 02715 Hot-Mix Asphaltic Base Course.

B. Tack Coat: Conform to requirements of Section 02735 Tack Coat. Where mixture shall adhere to surface on which it is to be placed without use of tack coat, tack coat may be eliminated when approved by the Project Manager.

C. Thoroughly clean base course surface of loose material by hand brooming or mechanical sweeping prior to application of tack coat or surface course. Prepare subgrade in advance of asphaltic concrete paving operation.

D. Perform pavement repair and resurfacing as indicated in Section 02845 Pavement Repair and Resurfacing.

E. Do not use cutback asphalt.

G. Milling of pavement for speed humps: Mill pavement (concrete or asphalt) to depth of one inch (1 In) and width between eighteen inches (18 In) and twenty-four inches (24 In) around entire perimeter of proposed hump, as shown in detail for speed hump design.

3.3 PLACEMENT

A. Do not place asphaltic pavement less than two inches (2 In) thick when surface temperature taken in shade and away from artificial heat is below fifty degrees Fahrenheit (50° F) and falling. Asphalt may be placed when temperature as measured above is above forty degrees Fahrenheit (40° F) and rising.

B. Haul prepared and heated asphaltic concrete mixture to project in tight vehicles previously cleaned of foreign material. Mixture temperature shall be between two hundred fifty degrees Fahrenheit (250° F) and

three hundred twenty-five degrees Fahrenheit (325° F) when laid.

C. Spread material into place with approved mechanical spreading and finishing machine of screening or tamping type.

D. Surface Course Material: Surface course two inches (2 In) or less in thickness may be spread in one (1) lift. Spread lifts in such a manner that, when compacted, finished course shall be smooth, of uniform density and shall be to section, line and grade as shown. Place construction joints on surface courses to coincide with lane lines or as directed by the Project Manager.

E. Joints: Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back laid material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

F. When new asphalt is laid against existing or old asphalt, saw cut existing or old asphalt to full depth to provide straight smooth joint.

G. In smaller restricted areas where use of paver is impractical spread material by hand. Compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove lumps that do not break down readily.

3.4 COMPACTION

A. Construct test strip to identify correct type, number and sequence of rollers necessary to obtain specified in-place density or air-voids when directed by the Project Manager. Prepare test strip at least one thousand feet (1000 Ft) in length, comparable to placement and compaction conditions for Project.

B. Begin rolling while pavement is still hot and as soon as it shall bear roller without shoving, displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water or petroleum by-products.

C. Compact surface thoroughly and uniformly, first with power-driven, three (3) wheel or tandem rollers weighing a minimum of eight tons (8 Tn). Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half (1/2) width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling

before mat temperature drops below one hundred eighty-five degrees Fahrenheit (185° F).

D. Use tandem roller for final rolling. Double coverage with approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.

E. Along walls, curbs, headers and similar structures and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

F. Compact binder course and surface course to a minimum density of ninety-one percent (91%) of maximum possible density of voidless mixture composed of same materials in like proportions.

3.5 TOLERANCES

A. Furnish templates for checking surface in finished sections. A maximum deflection of templates, when supported at center, shall not exceed one-eighth inch (1/8 In).

B. Completed surface, when tested with ten foot (10 Ft) straightedge laid parallel to center line of pavement, shall show no deviation in excess of one-eighth inch (1/8 In) in ten feet (10 Ft). Correct surface not meeting this requirement.

C. Dimensions of speed humps shall conform to details for speed hump design and speed hump height tolerances.

3.6 QUALITY CONTROL

A. Testing shall be performed under provisions of Section 02845 Pavement Repair and Resurfacing.

B. For in-place depth and density, take a minimum of one (1) core at random locations for each one thousand feet (1000 Ft) of single lane pavement. On a two (2) lane pavement, take samples at random every five hundred feet (500 Ft) from alternating lanes. Take cores for parking lots every five hundred square yards (500 Sy) of base to determine in-place depth and density. If cul-de sac or streets are less than five hundred feet (500 Ft), a minimum of two (2) cores [one (1) per lane] shall be procured. On small projects, take a minimum of two (2) cores for each day's placement. For first days placement and prior to coring, a minimum of five (5) nuclear gauge readings shall be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This

process shall continue for each day's placement until the Project Manager determines that a good basis has been established for the nuclear gauge.

C. Determine in-place density in accordance with TxDOT Tex-207-F and Tex-227-F from cores or sections. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by the Project Manager. Average densities for each street placed in a single day to determine compliance.

D. The Contractor may request three (3) additional cores in vicinity of cores indicating nonconforming in-place depths or density at no additional cost to the City. In-place depth and density at these locations shall be average of four (4) cores.

E. Fill cores and density test sections with new compacted asphaltic concrete.

F. Speed humps: Measure dimensions of completed speed hump, before applying pavement markings, at locations shown on Speed Hump Height Measurement Worksheet. Complete one (1) worksheet for each speed hump and send completed worksheets to the City of Friendswood, Department of Community Development, Engineering Division, 910 S. Friendswood Drive, Friendswood, Texas, 77546.

3.7 NONCONFORMING PAVEMENT

A. Recompact and retest nonconforming street sections not meeting surface test requirements or having unacceptable surface texture. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute. Retesting shall be at no additional cost to the City.

B. Remove and replace areas of asphalt surface found deficient in thickness by more than ten percent (10%). Use new asphaltic surface of thickness shown on the Drawings. Remove and replace areas of asphalt surface found deficient in average density.

C. Replace speed humps which do not conform to requirements of details or which are rejected by the Project Manager.

3.8 PROTECTION

A. Do not open pavement to traffic until completion of rolling and temperature has cooled to set asphaltic concrete surface or as shown

on the Drawings.

B. Maintain asphalt pavement in good condition until completion of the Work.

C. Repair defects immediately by replacing asphalt pavement to full depth.

3.9 PAVEMENT MARKINGS FOR SPEED HUMPS

A. Apply pavement markings to speed humps in conformance with dimensions shown on detail for speed hump design.

PART IV: TABLES

4.1 GRADATION OF COMPOSITE AGGREGATE

GRADATION OF COMPOSITE AGGREGATE		
SIEVE SIZE	PERCENT PASSING	
	Course Surface (TxDOT Type C)	Fine Surface (TxDOT Type D)
7/8□	100	-
5/8□	95 to 100	-
1/2"	-	100
3/8□	70 to 85	85 to 100
#4	43 to 63	50 to 70
#10	30 to 40	32 to 42
#40	10 to 25	11 to 26
#80	3 to 13	4 to 14
#200	1 to 6*	1 to 6*
VMA % Minimum	13	14

* 2 to 8 when Test Method Tes-200-F, Part II (Washed Sieve Analysis) is used.

4.2 PERFORMANCE GRADED BINDERS

PERFORMACE GRADED BINDER	
CRITERIA/TEST	**PERFORMANCE GRADE (PG64-22)**
Average 7-day Maximum Pavement Design Temperature, C	< 64
Minimum Pavement Design Temperature, C	> -22
ORIGINAL BINDER	
Flash Point Temperature, T48; Minimum C	230
Viscosity, ASTM D 4402; Maximum, 3Pa*s(3000 cp) Test Temperature, C	135
Dynamic Shear, TP5; G*/sin[ ], Minimum, 1.00 kPa Test Temperature @ 10 rad/sec., C	64
ROLLING THIN FILM OVEN (T240) OR THIN FILM OVEN (T179) RESIDUE	
Mass Loss, Maximum, %	1.00
Dynamic Shear, TP5; G*/sin[ ], Minimum, 2.20 kPa Test Temperature @ 10 rad/sec., C	64
PRESSURE AGING VESSEL RESIDUE (PP1)	
PAV Aging Temperature, C	100
Dynamic Shear, TP5; G*/sin[ ], Minimum, 5000 kPa Test Temperature @ 10/rad/sec., C	25
Physical Hardening	Report
Creep Stiffness, TP1; S. Maximum, 300 Mpa □value, Minimum, 0.300 Test Temperature @ 60 sec., C	-12
Direct Tension, TP3; Failure Strain, Minimum, 1.0% Test Temperature @ 1.0 mm/min., C	-12

4.3 DENSITY, STABILITY AND AIR VOID REQUIREMENTS

PERCENT DENSITY		PERCENT OPTIMUM	HVEEM Stability Percent Not Less Than
Min.	**Max.**		
94.5	97.5	96	35

END OF SECTION

SECTION 02805

CONCRETE PAVING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Portland cement concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for concrete paving is on a square yard basis. Separate pay items are used for each different required thickness of pavement.

2. Payment for concrete paving, high early strength, is on a square yard basis.

3. Measurement for utility projects: Match actual pavement replaced but no greater than a maximum pavement replacement limits shown on the Drawings.

4. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Standards for Testing and Materials.

1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A185 Standard Specifications for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

3. ASTM A615 Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

4. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

5. ASTM C33 Standard Specifications for Concrete Aggregates.

6. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

7. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

8. ASTM C42 Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

9. ASTM C94 Standard Specification for Ready-Mixed Concrete.

10. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

11. ASTM C136 Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

12. ASTM C138 Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.

13. ASTM C143 Standard Test Method for Slump of Hydraulic Cement Concrete.

14. ASTM C150 Standard Specification for Portland Cement.

15. ASTM C174 Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores.

16. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

17. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.

18. ASTM C494 Standard Specification for Chemical Admixtures for Concrete.

19. ASTM C618 Standard Specification for Coal Fly Ash and Raw

or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 02835 Concrete Pavement Curing.

6. Section 02840 Concrete Pavement Joints.

7. Section 03200 Reinforcing Steel.

C. TxDOT Texas Department of Transportation.

1. TxDOT Tex-203-F Sand Equivalent Test.

2. TxDOT Tex-406-A Material Finer than 75 Fm (No. 200) Sieve In Mineral Aggregates (Decantation Test for Cement Aggregates).

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit proposed mix design and test data for each type and strength of concrete in the Work. Include proportions and actual flexural strength obtained from design mixes at required test ages.

C. Submit for approval manufacturer s description and characteristics for mixing equipment, and for traveling form paver when proposed for use.

D. Submit manufacturer s certificates giving properties of reinforcing steel. Include certificate of compliance with ASTM A82. Provide specimens for testing when required by the Project Manager.

1.5 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without written permission of the Project Manager.

B. Class of aggregate being used may be changed before or during the Work with written permission of The Project Manager. When new class of aggregate is being used, it shall comply with this Technical Specification and shall be verified by the Project Manager.

C. Reject segregated aggregate. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.

D. Reject aggregates mixed with dirt, weeds or foreign matter.

E. Do not dump or store aggregate in roadbed.

1.6 DEFINITIONS

A. Batch materials proportioned for concrete according to the APPROVED mix design and adjusted for moisture in aggregates. Batch targets shall be based on mixed design parameters, adjusted for moisture and stay within tolerance the Specifications for proportioning in accordance with ASTM C685.

B. Cracks any split, rip or tear that penetrates the surface of the finished concrete. Crazing or spider cracks shall not be considered under this Section. The following are types of cracking with clear definitions and remedies which shall be followed:

1. Longitudinal Crack cracks that mostly follow the centerline of the roadway. In a case where the line runs diagonal to the centerline, it shall be determined by using the rise/run method whether or not the crack is parallel to the centerline of the road way. Any crack that has a run greater than the rise (perpendicular to the centerline) shall be considered a longitudinal crack. If said crack proceeds beyond a construction or expansion joint, this shall be considered the same crack. All concrete that has longitudinal cracks shall be replaced with no exceptions, and new maintenance bond given to cover one year (1 Yr) from date of replacement of concrete.

2. Shrinkage Crack cracks that are less than six hundredths inch (0.06 In) in width and no more than one-half inch (1/2 In) in depth shall be considered shrinkage cracks. No corrective action shall be required, but the length, width (at widest point) and depth (at widest point) shall be documented. At the one year (1 Yr) maintenance walkthrough, if any of these three (3) measurements have increased by ten percent (10%) or new shrinkage cracks have appeared in the same paving panel,

corrective action shall be taken as approved by the Director of Community Development. An extended maintenance bond may be required.

3. Stress Crack cracks that are more than six hundredths inch (0.06 In) but less than one-tenth inch (0.1 In) in width and of varying depths shall be considered stress cracks. These types of cracks are caused by tensile stress on concrete. Length, width and depth stress cracks shall be documented as described in 1.7.B.2 in this Section. Corrective action shall be taken as approved by the Director of Community Development. An extended maintenance bond may be required.

4. Structural Crack cracks greater than one-tenth inch (0.1 In) in width, no matter what depth shall be considered structural cracks. These types of cracks are caused by severe tensile stress on concrete and concrete failure. All concrete with structural cracks shall be replaced with no exceptions, and new maintenance bond given to cover one (1 Yr) year from date of replacement of concrete.

C. Joints:

1. Control joint shall either be a tooled or saw cut joint that shall control cracking of concrete paving. Control joints shall be spaced not greater than fifteen foot (15 Ft) intervals between expansion joints unless approved by the Project Manager.

2. Construction joint shall end a placement of concrete at the end of or at the centerline of a paving section. All construction joints shall use keyways to facilitate tie in to adjacent concrete placement.

3. Expansion joint shall end a paving panel or connect to existing pavement. Expansion joint shall use cedar wood material with a one inch (1 In) zip strip to allow for installation of sealant material. Dowels shall be imbedded as specified in the City of Friendswood Standard Detail Sheets. Expansion joints shall be placed not more than sixty feet (60 Ft) apart unless otherwise approved by the Project Manager.

D. Paving Panel defined as concrete paving from one (1) expansion/construction joint to the next expansion/construction joint in length and edge of paving/construction joint to the next edge of paving/construction joint. There shall be no full width monolithic paving or paving from edge of pavement to edge of pavement, if the placement

width exceeds fifteen feet (15 Ft), allowed at anytime.

PART II: PRODUCTS

2.1 MATERIALS

A. Portland Cement:

1. Sample and test cement to verify compliance with Standards of ASTM C150, Type I or Type III.

2. Bulk cement which meets referenced standards may be used when method of handling is approved by the Project Manager. When using bulk cement, provide satisfactory weighing devices.

3. Fly ash which meets standards of ASTM C618 may be used as mineral fill when method of handling is approved by the Project Manager.

B. Water: Conform to requirements for water in ASTM C94.

C. Coarse Aggregate: Crushed stone, gravel or combination thereof, which is clean, hard and durable, conforms to requirements of ASTM C33 and has abrasion loss not more than forty-five percent (45%) by weight when subjected to Los Angeles Abrasion Test (ASTM C131).

1. Maximum percentage by weight of deleterious substances shall not exceed values specified in TABLE 4.1 DELETERIOUS SUBSTANCES in this Section.

2. Conform coarse aggregate (size 1-1/2 inch to No. 4 sieve) to requirements of ASTM C33. Use gradation within limits specified in TABLE 4.2 COARSE AGGREGATE SIEVE ANLAYSIS REQUIREMENTS when graded in accordance with ASTM C136.

D. Fine Aggregate: Sand, manufactured sand or combination thereof, composed of clean, hard, durable, uncoated grains, free from loams or other injurious foreign matter. Conform fine aggregate for concrete to requirements of ASTM C33. Use gradation within TABLE 4.3 FINE AGGREGATE SIEVE ANALYSIS REQUIREMENTS in this Section, limits when graded in accordance with ASTM C136.

1. When subjected to color test for organic impurities (ASTM C40), fine aggregate shall not show color darker than standard

color. Fine aggregate shall be subjected to Sand Equivalent Test (Tex-203-F). Sand equivalent value shall not be less than eighty (80), unless higher value is shown on the Drawings.

E. Mineral Filler: **FLY ASH CAN ONLY BE USED WHEN DESIGN MIX HAS BEEN SUBMITTED AND APPROVED BY THE DIRECTOR OR DEPUTY DIRECTOR OF COMMUNITY DEVELOPMENT.** Type C or Type F fly ash of acceptable quality and meeting requirements of ASTM C618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, store and inspect in accordance with ASTM C618. Do not use fly ash in amounts ion excess of twenty-five percent (25%) by weight of cementatious material in mix design. Cement content may be reduced when strength requirements can be met. Note: When fly ash is used, the term "cement" is defined as cement plus fly ash.

F. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C260.

G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by the Project Manager.

H. Reinforcing Steel:

1. Provide new billet steel manufactured by open hearth process and conforming to ASTM A615, Grade 60. Store reinforcing steel to protect it from mechanical injury and rust. At time of placement, steel shall be free from dirt, scale, rust, paint, oil or other injurious materials.

2. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be rebent.

3. Provide wire fabric conforming to ASTM A82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds shall have sufficient strength to not be broken during handling or placing. Conform welding and fabrication of fabric sheets to ASTM A185.

4. Reinforcing Steel shall conform with Section 03200 Reinforcing Steel.

2.2 EQUIPMENT

A. Conform Equipment to requirements of ASTM C94.

2.3 MIXING

A. Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C31 and tested in accordance with ASTM C39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for the Work. Mix shall conform to these Technical Specifications and other requirements indicated on the Drawings.

B. Mix design to produce concrete which shall have compressive strength of two thousand seven hundred pounds per square inch (2700 psi) at seven days (7 D) and three thousand pounds per square inch (3000 psi) at twenty-eight days (28 D). Slump of concrete shall be at least three inches (3 In) but no more than five inches (5 In), when tested in accordance with ASTM C143.

1. Concrete pavement, including curb, curb and gutter and saw-tooth curb, shall contain at least five (5) sacks [ninety-four pounds (94 Lbs) per sack] of cement per cubic yard, with not more than six and one-half gallons (6-1/2 Gals) of water, net, per sack of cement (water-cement ratio maximum 0.57). Determine cement content in accordance with ASTM C138. Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.

2. Coarse dry aggregate shall not exceed eighty-five percent (85%) of loose volume of concrete.

3. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in the Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be four percent (4%) plus or minus one and one-half percent (± 1-1/2%). Determine air content by testing in accordance with ASTM C231.

4. Use retardant when temperature exceeds ninety degrees Fahrenheit (90° F). Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Use high early strength concrete pavement to limits shown on the Drawings. Design to meet following:

1. Concrete Mix: Compressive strength greater than or equal to three thousand pounds per square inch (3000 psi) at seventy-two hours (72 Hrs).

2. Cement: Minimum of seven (7) sacks of cement per cubic yard of concrete.

3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of five inches (5 In), when tested in accordance with ASTM C143.

4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Section.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted base is ready to support imposed loads and meets compaction requirements.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Properly prepare, shape and compact each section of subgrade before placing forms, reinforcing steel or concrete. After forms have been set to proper grade and alignment, use subgrade planer to shape subgrade to its final cross section. Check contour of subgrade with template.

B. Remove subgrade that shall not support loaded form. Replace and compact subgrade to required density.

C. After one inch (1 In) or more of consecutive rain, retest subgrade for compaction and moisture. Replace or, scarify and compact, to achieve required density.

3.3 EQUIPMENT

A. Alternate equipment and methods, other than those required by this Section, may be used provided equal or better results shall be obtained. Maintain equipment for preparing subgrade and for finishing and

compacting concrete in good working order.

B. Subgrade Planer and Template:

1. Use subgrade planer with adjustable cutting blades to trim subgrade to exact section shown on the Drawings. Select planer mounted on visible rollers which ride on forms. Planer frame must have sufficient weight so that it shall remain on form and have strength and rigidity that, under tests made by changing support from wheels to center, planer shall not develop deflection of more than one-eighth inch (1/8 In). Tractors used to pull planer shall not produce ruts or indentations in subgrade. When slip form method of paving is used, operate subgrade planer on prepared track grade or have it controlled by electronic sensor system operated from string line to establish horizontal alignment and elevation of subbase.

2. Provide template for checking contour of subgrade. Template shall be long enough to rest upon side forms and have strength and rigidity that, when supported at center, maximum deflection shall not exceed one-eighth inch (1/8 In). Fit template with accurately adjustable rods projecting downward at one foot (1 Ft) intervals. Adjust these rods to gauge cross sections of slab bottom when template is resting on side forms.

C. Machine Finisher: Provide power-driven, transverse finishing machine designed and operated to strike off and consolidate concrete. Machine shall have two (2) screeds accurately adjusted to crown of pavement and with frame equipped to ride on forms. Use finishing machine with rubber tires when it operates on concrete pavement.

D. Hand Finishing:

1. Provide mechanical strike and tamping template two feet (2 Ft) longer than width of pavement to be finished. Shape template to pavement section.

2. Provide two (2) bridges to ride on forms and span pavement for finishing expansion and control joints. Provide floats and necessary edging and finishing tools.

E. Burlap Drag or transverse broom for Finishing Slab: Furnish four (4) plies of ten ounce (10 Oz) burlap material fastened to bridge to form continuous strip of burlap full width of pavement. Maintain contact of three foot (3 Ft) width of burlap material with pavement surface. Keep burlap drags clean and free of encrusted mortar.

F. Vibrators: Furnish mechanically-operated, synchronized vibrators mounted on tamping bar which rides on forms and hand-manipulated mechanical vibrators. Furnish vibrators with frequency of vibration to provide maximum consolidation of concrete without segregation.

G. Traveling Form Paver: Approved traveling form paver may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. Meet requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship. When traveling form paver does not provide concrete paving that meets compaction, finish and tolerance requirements of this Technical Specification, immediately discontinue its use and use conventional methods.

1. Equip traveling paver with longitudinal transangular finishing float adjustable to crown and grade. Use float long enough to extend across pavement to side forms or edge of slab.

2. Ensure that continuous deposit of concrete can be made at paver to minimize starting and stopping. Use conventional means of paving locations inaccessible to traveling paver or having horizontal or vertical curvature that traveling paver cannot negotiate.

3. Where the Drawings require tie bars for adjacent paving, securely tie and support bars to prevent displacement. Tie bars may be installed with approved mechanical bar inserter mounted on traveling-form paver. Replace pavement in which tie bars assume final position other than that shown on the Drawings.

3.4 FORMS

A. Side Forms: Use metal forms of approved shape and section. Preferred depth of form is equal to required edge thickness of pavement. Forms with depths greater or less than required edge thickness of pavement shall be permitted, provided difference between form depth and edge thickness is not greater than one inch (1 In), and further provided that forms of depth less than pavement edge are brought to required edge thickness by securely attaching wood or metal strips to bottom of form or by grouting under form. Bottom flange of form shall be same size as thickness of pavement. Aluminum forms are not allowed. Forms shall be approved by the Project Manager. Length of form sections shall be not less than ten feet (10 Ft) and each section shall provide for staking in position with not less than three (3)

pins. Flexible or curved forms of wood or metal of proper radius shall be used for curves of two hundred foot (200 Ft) radius or less. Forms shall have ample strength and shall be provided with adequate devices for secure setting so that when in-place they shall withstand, without visible springing or settlement, impact and vibration of finishing machine. In no case shall base width be less than eight inches (8 In) for form eight inches (8 In) or more in height. Forms shall be free from warp, bends or kinks and shall be sufficiently true to provide straight edge on concrete. Top of each form section, when tested with straight edge, shall conform to requirements specified for surface of completed pavement. Provide sufficient forms for satisfactory placement of concrete. For short radius curves, forms less than ten feet (10 Ft) in length or curved forms may be used. For curb returns at street intersections and driveways, wood forms of good grade and quality may be used.

B. Form Setting:

1. Rest forms directly on subgrade. Do not shim with pebbles or dirt. Accurately set forms to required grade and alignment and, during entire operation of placing, compacting and finishing of concrete, do not deviate from this grade and alignment more than one-eighth inch (1/8 In) in ten feet (10 Ft) of length. Do not remove forms for at least eight hours (8 Hrs) after completion of finishing operations. Provide supply of forms that shall be adequate for orderly and continuous placing of concrete. Set forms and check grade for at least 300 feet ahead of mixer or as approved by the Project Manager.

2. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. Do not use adjacent slabs for forms until concrete has aged at least seven days (7 D).

3.5 REINFORCING STEEL AND JOINT ASSEMBLIES

A. Place reinforcing steel and joint assemblies and position securely as indicated on the Drawings. Wire reinforcing bars securely together at ends and splices, remaining mat shall be fifty percent (50%) tied at intersections. Bars and coatings shall be free of rust, dirt or other foreign matter when concrete is placed. Secure reinforcing steel to chairs.

B. Position pavement joint assemblies at required locations and elevations and rigidly secure in position. Install dowel bars in joint assemblies, each parallel to pavement surface and to center line of pavement, as

shown.

C. Cut header boards, joint filler, and other material used for forming joints to receive each dowel bar.

D. Secure in required position to prevent displacement during placing and finishing of concrete.

E. Drill dowels into existing pavement, secure with approved epoxy, and provide paving headers as required to provide rigid pavement sections.

F. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on the Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than one-twelfth (1/12) of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch (1/4 In).

3.6 FIBROUS REINFORCING

A. Do not use fibrous reinforcing to replace structural, load-bearing or moment-reinforcing steel.

3.7 PLACEMENT

A. Place concrete when air temperature taken in shade and away from artificial heat is above thirty-five degrees Fahrenheit (35° F) and rising. Do not place concrete when air temperature is below forty degrees Fahrenheit (40° F) and falling.

B. Place concrete within ninety minutes (90 Min) after initial water had been added. Remove and dispose of concrete not placed within this period.

C. Concrete slump during placement shall be three inches (3 In) to five inches (5 In), except when using traveling-form paver which require slump shall be a maximum of three inches (3 In).

D. Deposit concrete continuously in successive batches. Distribute concrete in manner that shall require as little rehandling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than thirty minutes (30 Min), place transverse construction joint at stopping point. Remove and replace sections less than ten feet (10 Ft) long.

E. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement shall be cause for rejection of pavement sections.

3.8 COMPACTION

A. Consolidate concrete using mechanical vibrators as specified herein. Extend vibratory unit across pavement, not quite touching side forms. Space individual vibrators at close enough intervals to vibrate and consolidate entire width of pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

3.9 FINISHING

A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.

1. Hand finish with mechanical strike and tamping template in same width as pavement to be finished. Shape template to pavement section shown on the Drawings. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make a minimum of two (2) trips over each area. Screed pavement surface to required section. Work screed with combined transverse and longitudinal motion in direction work is progressing. Maintain screed in contact with forms. Use longitudinal float to level surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with strike-off screed. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Tamp concrete with tamping template. Use longitudinal float to level surface.

C. After completion of straightedge operation, make first (1st) pass of burlap drag or transverse broom as soon as construction operations

permit and before water sheen has disappeared from surface. Follow with as many passes as required to produce desired texture depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

3.10 JOINTS AND JOINT SEALING

A. Conform to requirements of Section 02840 Concrete Pavement Joints.

3.11 CONCRETE CURING

A. Conform to requirements of Section 02835 Concrete Pavement Curing.

3.12 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish. Place ten foot (10 Ft) straightedge parallel to center of roadway to bridge depressions and touch high spots. Do not permit deviation measured from face of straight edge to surface of pavement to exceed one-sixteenth inch (1/16 In) per one foot (1 Ft) from nearest point of contact. Maximum deviation with ten foot (10 Ft) straightedge shall not exceed one-eighth inch (1/8 In). Grind spots in excess of required tolerances to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

3.13 FIELD QUALITY CONTROL

A. Perform testing under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures

B. Compressive Strength Test Specimens: Make four (4) test specimens for compressive strength test in accordance with ASTM C31 for each one hundred cubic yards (100 Cy)or less of pavement that is placed in one (1) day. Test two (2) specimens at seven days (7 D), or at number of hours as directed by the Project Manager for high early strength concrete. Test remaining two (2) specimens at twenty-eight days (28 D). Test specimens in accordance with ASTM C39. Minimum compressive strength shall be at least two thousand seven hundred pounds per square inch (2700 psi) for first two (2) specimens tested at seven days (7 D) and three thousand pounds per square inch (3000 psi) for the second two (2) specimens tested at twenty-eight days (28 D).

C. When compressive test indicates failure, make yield test in accordance with ASTM C138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. Minimum of one (1) four inch (4 In) core shall be taken at random locations per one thousand square yards (1000 Sy) of pavement to measure in-place depth. Measure depth in accordance with ASTM C174. Each core may be tested for twenty-eight day (28 D)compressive strength according to methods of ASTM C42. Twenty-eight (28) day compressive strength of each core tested shall be a minimum of three thousand pounds per square inch (3000 psi).

E. Request, at option of the Project Manager, three (3) additional cores in vicinity of cores indicating the nonconforming in-place depths at no cost to the City. In-place depth at these locations shall be average depth of four (4) cores.

F. Fill cores and density test sections with new concrete paving or non shrink grout.

G. Alternative testing for depth may be performed using string line and random testing of locations for depth before concrete is placed.

3.14 NONCONFORMING PAVEMENT

A. Remove and replace areas of pavement found deficient in thickness by more than ten percent (10%) or that fail compressive strength tests, with concrete of thickness and strength shown on the Drawings.

B. When measurement of any core is less than specified thickness by more than ten percent (10%), actual thickness of pavement in this area shall be determined by taking additional cores at ten foot (10 Ft) intervals parallel to centerline in each direction from deficient core until, in each direction, core is taken which is not deficient by more than ten percent (10%). Exploratory cores for deficient thickness shall not be used in averages for adjusted unit price. Exploratory cores are to be used only to determine length of pavement in unit that is to be removed and replaced. Replace nonconforming pavement sections at no additional cost to the City.

3.15 PAVEMENT MARKINGS

A. Restore pavement markings to match those existing in accordance with the City of Friendswood Technical Specifications and Standard Details

and the Project Manager's requirements.

3.16 PROTECTION

A. Barricade pavement section to prevent use until concrete has attained a minimum design strength. Cure barricade pavement section for a minimum of seventy-two hours (72 Hrs) before use. Do not open pavement to light construction traffic until concrete is at least ten days (10 D) old. No heavy loads shall be placed on concrete before twenty-eight day (28 D) breaks have passed. Pavement may be open to traffic earlier provided the Contractor pays for testing and additional specimens once the seven day (7 D) specified strength is obtained. Pavement may be opened when high early strength concrete is used and meets the specified seventy-two hour (72 Hr) strength.

B. High early strength concrete may be used to provide access at driveways, street intersections, esplanades and other locations approved by the Project Manager.

C. On those sections of pavement to be opened to traffic, seal joints, clean pavement, and place earth against pavement edges before permitting use by traffic. Opening of pavement to traffic shall not relieve responsibility for the Work.

D. Maintain concrete paving in good condition until completion of the Work.

E. Repair defects by replacing concrete to full depth.

PART IV: TABLES

4.1 DELETERIOUS SUBSTANCES

ITEM	PERCENT BY WEIGHT OF TOTAL SAMPLE MAXIMUM
Clay lumps and friable particles	3.0
Material finer than No. 200 sieve:	
Concrete subject to abrasion	3.0*
All other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of Importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than No. 200 sieve consists of dust of fracture, essentially free of clay or shale, then these limits may be increased to five percent (5%) and seven percent (7%) respectively.

4.2 COARSE AGGREGATE SIEVE ANLAYSIS REQUIREMENTS

SIEVE DESIGNATION (SQUARE OPENINGS)	PERCENTAGE BY WEIGHT
Retained on 1 ¾" sieve	0%
Retained on 1 ½" sieve	0% to 5%
Retained on 3/4" sieve	30% to 65%
Retained on 3/8 sieve	70% to 90%
Retained on No. 4 sieve	95% to 100%
Loss by Decantation Test:	
*Method Tex-406-A	1.0 maximum

* In case of aggregates made primarily from crushing of stone, when material finer than No. 200 sieve is dust fracture essentially free from clay or shale as established by Part III of TxDOT Tex-406-A, percent may be increased to one and one-half percent (1.5%).

4.3 FINE AGGREGATE SIEVE ANLAYSIS REQUIREMENTS

SIEVE DESIGNATION (SQUARE OPENINGS)	PERCENTAGE BY WEIGHT
Retained on 3/8" sieve	0%
Retained on No. 4 sieve	0% to 5%
Retained on No. 8 sieve	0% to 20%
Retained on No. 16 sieve	15% to 50%
Retained on No. 30 sieve	35% to 75%
Retained on No. 50 sieve	65% to 90%
Retained on No. 100 sieve	90% to 100%
Retained on No. 200 sieve	97% to 100%

END OF SECTION

SECTION 02815

HEADERS, CURB, CURB AND GUTTER

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Reinforced concrete curb, reinforced monolithic concrete curb and gutter, and mountable curb.

B. Paving headers and railroad headers poured monolithically with concrete base or pavement.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for curbs, curbs and gutter and esplanade curbs is on a linear foot basis measured along face of curb.

2. Payment for three foot (3 Ft) concrete valley gutter is on a linear foot basis.

3. Payment for mountable concrete curbs is on a square foot basis.

4. Payment for concrete paving headers and concrete railroad headers is on a linear foot basis.

5. Payment for headers is on linear foot basis measured between lips of gutters adjacent to concrete base or measured between backs of curbs adjacent to concrete pavement.

6. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit details of proposed form work for approval.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.
2. Section 01330 Submittal Procedures.
3. Section 02805 Concrete Paving.
4. Section 02835 Concrete Pavement Curing.
5. Section 02840 Concrete Pavement Joints.

PART II: PRODUCTS

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02805 Concrete Paving.

B. Reinforcing Steel: Conform to material requirements for welded wire fabric of Section 02805 Concrete Paving.

C. Grout: Nonmetallic, nonshrink grout containing no chloride producing agents conforming to requirements specified in TABLE 4.1 NONSHRINK GROUT REQUIREMENTS, in PART IV of this Section.

D. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02840 Concrete Pavement Joints.

E. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Section 02840 Concrete Pavement Joints.

F. Mortar: Mortar finish composed of one (1) part Portland cement and one and one-half (1-1/2) parts of fine aggregate. Use only when approved by the Project Manager.

PART III: EXECUTION

3.1 PREPARATION

A. Prepare subgrade in accordance with applicable portions of sections on excavation and fill, embankment and subgrade and roadbed.

3.2 PLACEMENT

A. Guideline: Set to follow top line of curb. Attach indicator to provide constant comparison between top of curb and guideline. Ensure flow lines of gutters on monolithic curb and gutters conform to slopes indicated on the Drawings.

B. Forms: Brace to maintain position during pour. Use metal templates cut to section shown on the Drawings.

C. Reinforcement: Secure in position so that steel shall remain in place throughout placement. Reinforcing steel shall remain at approximate center of base or pavement as indicated on the Drawings.

D. Joints: Place in accordance with Section 02840 Concrete Pavement Joints. Place dummy groove joints at driveways to match concrete pavement joints at right angles to curb lines. Cut dummy grooves one-quarter inch (1/4 In) deep using approved edging tool.

E. Place concrete in forms to required depth. Consolidate thoroughly. Do not permit rock pockets in form. Entirely cover top surfaces with mortar.

F. Verify headers are to the depth and the rebar is in place according to the City of Friendswood Standard Details.

3.3 MANUAL FINISHING

A. For monolithic curb and gutters, remove front curb forms, after concrete is in place. Form exposed portions of curb and of curb and gutter, using mule which conforms to curb shape, as shown on the Drawings.

B. Thin coat of mortar may be worked into exposed face of curb or curb and gutter using mule and two (2) handled wooden darby at least three feet (3 Ft) long.

C. Before applying final finish move ten foot (10 Ft) straightedge across curb or across gutter and up curb to back form of curb. Repeat until curb and gutter are true to grade and section. Lap straightedge over previous finish operation by five feet (5 Ft).

D. Steel trowel finish surfaces to smooth, even finish. Make face of finished curb true and straight.

E. Edge outer edge of gutter with one-quarter inch (1/4 In) edger. Finish edges with tool having one-quarter inch (1/4 In) radius.

F. Finish visible surfaces and edges of finished curb or curb and gutter free from blemishes, form marks and tool marks. Finished curb or curb and gutter shall have uniform color, shape and appearance.

3.4 MECHANICAL FINISHING

A. Mechanical curb or curb and gutter forming and finishing machines may be used instead of, or in conjunction with, previously described methods, when approved by the Project Manager. Use of mechanical methods shall provide specified curb or curb gutter design and finish.

3.5 CURING

A. Immediately after finishing operations, cure exposed surfaces of curb or curb and gutter in accordance with Section 02835 Concrete Pavement Curing.

3.6 TOLERANCES

A. Top surfaces of curb or curb and gutter shall have uniform width and shall be free from humps, sags or other irregularities. Surfaces of curb top, curb face and gutter shall not vary more than one-eighth inch (1/8 In) from edge of straightedge laid along them, except at grade changes.

3.7 PROTECTION

A. Maintain newly placed headers, curbs and curbs and gutters in good condition until completion of the Work.

B. Replace damaged headers, curbs and curbs and gutters to comply with this Section.

PART IV: TABLES

4.1 NONSHRINK GROUT REQUIREMENTS

Compressive Strength:	
At 7 days	3500 psi
At 28 days	8000 psi
Initial Set Time	45 minutes
Final Set Time	1.5 hours

END OF SECTION

SECTION 02820

CONCRETE SIDEWALKS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Reinforced concrete sidewalks.

B. Wheelchair ramps.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for concrete sidewalks is on a square foot basis.

2. No separate payment shall be made for work outside these limits or in areas where sidewalks or wheelchair ramps have been removed or replaced for the Contractor s convenience.

3. Payment for wheelchair ramps of each type specified is on a per ramp basis.

4. Removal and replacement of existing sidewalks, curb or curb and gutter and saw-cutting is paid on a unit cost basis for each item.

5. Sodding shall be paid one foot (1 Ft) on each side of sidewalk unless otherwise noted.

6. Coloring of wheelchair ramps is included in cost of ramp.

7. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in Field.

2. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

3. ASTM C42 – Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

4. ASTM C138 – Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.

5. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.

6. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

7. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3).

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 01580 – Waste Material Disposal.

6. Section 02100 – Clearing and Grubbing.

7. Section 02140 – Utility Backfill Materials.

8. Section 02720 – Lime-Stabilized Base Subgrade.

9. Section 02805 – Concrete Paving.

10. Section 02825 – Colored Concrete for Wheelchair Ramps.

11. Section 02835 – Concrete Pavement Curing.

12. Section 02840 Concrete Pavement Joints.

13. Section 02845 Pavement Repair and Resurfacing.

14. Section 02915 Sodding.

15. Section 03200 Reinforcing Steel.

C. TASABA Texas Accessibility Standards of Architectural Barriers Act, of the Texas Civil Statues.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certified testing results and certificates of compliance.

PART II: PRODUCTS

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02805 Concrete Paving.

B. Reinforcing Steel: Conform to material requirements of Section 02805 Concrete Paving for reinforcing steel. Use No. 3 (3/8 In) reinforcing bars.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02840 Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Section 02840 Concrete Pavement Joints.

E. Forms: Use straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk or wheelchair ramp thickness. The use of two inch by four inch (2 In x 4 In) lumber as forms shall not be allowed.

F. Sand Bed: Conform to material requirements for bank run sand of Section 02140 Utility Backfill Materials.

G. Sodding: Conform to material requirements for sodding of Section 02915 Sodding.

H. Coloring for wheelchair ramps: Conform to material requirements for colored concrete of Section 02825 Colored Concrete for Wheelchair Ramps.

PART III: EXECUTION

3.1 REPLACEMENT

A. Replace sidewalks which are removed or damaged during construction with thickness and width equivalent to one (1) removed or damaged, unless otherwise shown on the Drawings. Finish surface (exposed aggregate, stamped concrete, etc.) to match existing sidewalk.

B. Provide wheelchair ramps or existing, replaced or new sidewalks when sidewalk intersects curb at street or driveway.

3.2 PREPARATION

A. Identify and protect utilities which are to remain.

B. Protect living trees, other plant growth and features designated to remain.

C. Conduct clearing and grubbing operations in accordance with Section 02100 Clearing and Grubbing.

D. Excavate subgrade six inches (6 In) beyond outside lines of sidewalk or wheelchair ramp. Shape to line, grade and cross section. For soils with plasticity index above forty percent (40%), stabilize soil with lime in accordance with Section 02720 Lime-Stabilized Base Subgrade. Compact subgrade to minimum of ninety percent (90%) maximum dry density at optimum moisture content plus or minus three percent (±3%), as determined by ASTM D698.

E. Immediately after subgrade is prepared, cover with compacted sand bed to depth as shown on the Drawings. Lay concrete when sand is moist but not saturated.

3.3 PLACEMENT

A. Setting Forms: Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. Use of two inch by four inch (2 In x 4 In) wood studs as forms shall not be allowed. Securely stake forms to line and grade. Maintain position during concrete placement.

B. Reinforcement:

1. Install reinforcing bars in conformance of Section 03200 Reinforcing Steel.

2. Install reinforcing steel as shown on the drawings. Lay longitudinal bars in sidewalks or wheelchair continuously, except through expansion joints.

3. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.

4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy and provide headers as required.

5. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on the Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than one and one-half (1-1/2) of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch (1/4 In).

C. Expansion Joints: Install expansion joints with load transfer units in accordance with Section 02840 Concrete Pavement Joints.

D. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp or other acceptable method. Bring mortar to surface.

E. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush, and impress or hand-groove required pattern into wheelchair ramp.

F. Apply coating to wheelchair ramp with contrasting color in accordance with Section 02825 Colored Concrete for Wheelchair Ramps.

G. Unless otherwise indicated on the Drawings, install construction sidewalk joints one-eighth inch (1/8 In) deep, at intervals not exceeding five feet (5 Ft). Use joint tool equal in width to edging tool.

H. Finish edges with tool having one-quarter inch (1/4 In) radius.

I. After concrete has set sufficiently, refill space along sides of sidewalk to

one inch (1 In) from top of walk with suitable fill material. Tamp until firm and solid, place sod as applicable. Dispose of excess material in accordance with Section 01580 Waste Material Disposal. Repair driveways and parking lots damaged by sidewalk excavation in accordance with Section 02845 Pavement Repair and Resurfacing.

3.4 CURING

A. Conform to requirements of Section 02835 Concrete Pavement Curing.

3.5 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Compressive Strength Test Specimens: Four (4) test specimens for compressive strength test shall be made in accordance with ASTM C31 for each thirty cubic yards (30 Cy) or less of sidewalk that is placed in one day (1 D). Two (2) specimens shall be tested at seven days (7 D). Remaining two (2) specimens shall be tested at twenty-eight days (28 D). Specimens shall be tested in accordance with ASTM C39. Minimum compressive strength: two thousand seven hundred pounds per square inch (2700 psi) at seven days (7 D) for first two (2) specimens and three thousand pounds per square inch (3000 psi) at twenty-eight days (28 D) for the second two (2) specimens.

C. Yield test for cement content per cubic yard of concrete shall be made in accordance with ASTM C138. When cement content is found to be less than that specified per cubic yard, reduce batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. If the Contractor places concrete without notifying the laboratory, the City shall have the concrete tested by means of core test as specified in ASTM C42. When concrete does not meet this specification, cost of test, shall be deducted from the Contractor's payment.

E. Sampling of fresh concrete shall be in accordance with ASTM C172.

F. Take slump tests when cylinders are made and when concrete slump appears excessive.

G. Concrete shall be acceptable when average of two (2) twenty-eight (28) day compression tests is equal to or greater than minimum twenty-eight day (28 D) strength specified.

H. If either of two (2) tests on field samples is less than average of two (2) tests by more than ten percent (10%), that entire test shall be considered suspect and not indicative of concrete strength. Core samples shall be required from in-place concrete in question.

I. If twenty-eight day (28 D) laboratory test indicates that concrete of low strength has been placed, test concrete in question by taking cores as directed and approved by the Project Manager. Take and test at least three (3) representative cores as specified in ASTM C42 and deduct cost from payment due.

3.6 NONCONFORMING CONCRETE

A. Remove and replace areas that fail compressive strength tests, or thickness of concrete shown on the Drawings.

B. Replace non-conforming sections at no additional cost to the City.

3.7 PROTECTION

A. Maintain newly-placed concrete in good condition until completion of the Work.

B. Replace damaged areas.

END OF SECTION

SECTION 02840

CONCRETE PAVEMENT JOINTS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Joints for concrete paving, concrete sidewalks, concrete driveways, mountable curbs, curbs and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for street pavement expansion joints, with or without load transfer, is on a linear foot basis.

2. No separate payment shall be made for horizontal dowels. Include payment in the unit price for Concrete Paving, Concrete Driveways, Concrete Sidewalks or Curb and Gutter.

3. No separate payment shall be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in the unit price for Concrete Paving.

4. No separate payment shall be made for joints for Mountable Curbs, Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks and Concrete Driveways. Include payment in the unit price for Mountable Curbs, Curbs, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks and Concrete Driveways.

5. Payment shall be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).

6. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this

Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2. ASTM D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

3. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

4. ASTM D3405 Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

C. TxDOT Texas Department of Transportation.

1. TxDOT Tex-525-C Tests for Asphalt and Concrete Joint Sealers.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel caps, metal supports and deformed metal strip for approval. Submit manufacturer s recommendation for placing sealant(s).

PART II: PRODUCTS

2.1 BOARD EXPANSION JOINT MATERIAL

A. Filler board of selected stock: Use wood of density and type as follows:

1. Clear, all-heart cypress weighing no more than forty pounds per cubic foot (40 Lbs/Cf), after being oven dried to constant weight.

2. Clear, all-heart redwood weighing no more than thirty pounds per cubic foot (30 Lbs/Cf), after being oven dried to constant weight.

2.2 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D994 and ASTM D1751.

2.3 JOINT SEALING COMPOUND

A. Joint sealants shall conform to one (1) of the sealant classes described in this Section.

B. Hot-poured rubber-asphalt compound to conform to ASTM D3405.

C. Two (2) component Synthetic Polymer.

1. Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles.

2. Cure sufficiently at average temperature of seventy-seven degrees Fahrenheit (77° F) plus or minus two degrees Fahrenheit (± 2° F) so as not to pick up under wheels of traffic in a maximum of three hours (3 Hrs).

3. Performance requirements, when tested in accordance with TxDOT Tex-525-C, shall meet above curing times and requirements as specified in TABLE 4.1 COLD EXTRUDED AND COLD POURABLE (SELF LEVELING) SPECIFICATIONS in this Section.

4. Provide cold-extruded type for vertical or sloping joints.

5. Provide self-leveling type for horizontal joints.

D. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete Joints. This shall be a single component self-leveling silicone or polyurethane material that is compatible with both asphalt and concrete pavements. The sealer shall not require a primer for bond; a backer rod shall be required shall

be compatible with the sealant; no reaction shall occur between rod and sealant. When tested in accordance with TxDOT Tex-525-C, self-leveling sealant shall meet requirements as specified in TABLE 4.2 SELF-LEVELING, LOW MODULUS OR POLYURETHANE SEALEANT SPECIFICATIONS in this Section.

2.4 LOAD TRANSMISSION DEVICES

A. Smooth, steel dowel bars conforming to ASTM A615, Grade 60. When indicated on the Drawings, encase one (1) end of dowel bar in approved cap having inside diameter one-sixteenth inch (1/16 In) greater than diameter of dowel bar.

B. Deformed steel tie bars conforming to ASTM A615, Grade 60.

2.5 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

A. Employ supports of approved shape and size that shall secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by the Project Manager.

PART III: EXECUTION

3.1 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw cut existing pavement a minimum of two inches (2 In) deep to provide straight, smooth joint surface without chipping, spalling or cracks.

C. All new concrete joints shall be placed as shown in the City of Friendswood Standard Details.

3.2 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than thirty minutes (30 Min). Place longitudinal construction joints at interior edges of pavement lanes using #6 (3/4 In) deformed tie bars, thirty inches (30 In) long and spaced sixteen inches (16 In) on centers and use keyways.

3.3 EXPANSION JOINTS

A. Place three-quarters inch (3/4 In) wide expansion joints at radius points of curb returns for cross street intersections or as located in adjacent pavement but no further than sixty feet (60 Ft) apart. Use no boards shorter than six feet (6 Ft). When pavement is twenty-four feet (24 Ft) or narrower, use not more than two (2) lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross-section of concrete slab. Use load transmission devices of type and size shown on the Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on the Drawings.

B. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove a minimum of one-quarter inch (1/4 In) wide. Maintain depth of one-quarter (1/4) of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one (1) pass. Complete sawing within twenty-four hours (24 Hrs) of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

C. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on the Drawings. If more than fifteen feet (15 Ft) in width is poured, longitudinal joint must be saw cut. Seal sawed or tooled groove with joint sealing compound.

3.6 EXPANSION AND CONTRACTION JOINTS FOR MOUNTABLE CURB, CURB, CURB AND GUTTER

A. Place three-quarters inch (3/4 In) wide preformed expansion joints through mountable curb, curb, curb and gutters at locations of

expansion and contraction joints in adjacent pavement, at end of radius returns, at street intersections, at driveways, at curb inlets and any other location directed by the Project Manager. Maximum spacing between joints shall be fifteen feet (15 Ft) for contraction joints and sixty feet (60 Ft) for expansion joints.

3.7 EXPANSION AND CONTRACTION JOINTS FOR CONCRETE SIDEWALKS

A. Provide three-quarters inch (3/4 In) wide expansion joints conforming to ASTM A1751 across sidewalk at intervals no greater than sixty feet (60 Ft) and along sidewalks at back of curbs, at intersections with driveways, steps and walls. Provide expansion joint material conforming to ASTM D994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab. Saw-cut or tool contraction joints into sidewalk at intervals not exceeding five feet (5 Ft).

3.8 EXPANSION JOINTS FOR CONCRETE DRIVEWAYS

A. Provide three-quarters inch (3/4 In) wide expansion joints conforming to ASTM D1751 across driveway at street pavement, at right-of-way line, at existing concrete driveways and intersections with sidewalks and other structures or as shown on the Drawings. Extend expansion joint material full depth of slab. Contraction joints are not normally required, unless shown on the Drawings or as directed by the Project Manager.

3.9 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above fifty degrees Fahrenheit (50° F) and less than eighty-five degrees Fahrenheit (85° F) and weather is not foggy or rainy.

B. Use joint-sealing equipment in like new working condition throughout joint sealing operation and be approved by the Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, contraction joints and cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that upon completion, surface of sealer within joint shall be one-quarter inch (1/4 In) above level of adjacent surface or at

elevation as directed by the Project Manager.

3.10 PROTECTION

A. Maintain newly-placed joints in good condition until completion of the Work.

B. Replace damaged joints material with new material as required by this Section.

PART IV: TABLES

4.1 COLD EXTRUDED AND COLD POURABLE (SELF LEVELING) SPECIFICATIONS.

COLD EXTRUDED AND COLD POURABLE (SELF-LEVELING) SPECIFICATIONS	
PROPERTY	**REQUIREMENT**
Penetration, 25° C (77° F), 150g Cone, 5 s, 0.1 mm (in.), maximum	130
Bond and Extension 50%, -29° C (-20° F), 3 cycles:	
Dry Concrete Block	Pass
Steel blocks (Primed, if recommended by manufacturer)*	Pass
Flow at 70° C (158° F)	None
Water content % by mass, maximum	5.0
Resilience:	
Original sample, % minimum (cured)	50
Oven-aged at 70° C (158° F), % minimum	50
Cold Extruded material only □ Cold Flow (10 minutes)	None

After bond extension test, there shall be no evidence of cracking, separation or other opening that is over one-eighth inch (1/8 in.) deep in sealer or between sealer and test blocks.

* Steel blocks shall be used when armor joints are specified.

4.2 SELF-LEVELING, LOW MODULUS OR POLYURETHANE SEALEANT SPECIFICATIONS

SELF-LEVELING, LOW MODULUS SILICONE OR POLYURETHANE SPECIFICATIONS	
PROPERTY	**REQUIREMENT**
Tack Free Time, 25° ± 1° C (77° ± 2° F), minutes	120 maximum
Nonvolatile content, % by mass	93 minimum
Tensile Strength and 24 Hour Extension Test:	
Initial, 10-day cure 25° ± 1° C (77° ± 2° F), kPa (psi)	21 to 69 (3 to 10)
After Water Immersion, kPa (psi)	21 to 69 (3 to 10)
After Heat Aging, kPa (psi)	21 to 69 (3 to 10)
After Cycling -29° C (-20° F), 50%, 3 cycles, kPa (psi)	21 to 69 (3 to 10)
24 Hour Extension	Pass (All Specimens)

After twenty-four hours (24 Hrs), there shall be no evidence of cracking, separation or other opening that is over one eighth inch(1/8 in.) deep at any point in the sealer or between the sealer and test blocks.

END OF SECTION

SECTION 02845

PAVEMENT REPAIR AND RESURFACING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Repairing and resurfacing streets, highways, driveways, sidewalks and other pavements that have been cut, broken or otherwise damaged during construction.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for pavement repair and resurfacing under this Section. Payment shall be in accordance with Measurement and Payment for work as required in appropriate sections.

2. Refer to Section 01270 □ Measurement and Payment for other unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01580 □ Waste Material Disposal.

4. Section 02105 □ Removing Existing Pavements and Structures.

5. Section 02110 □ Borrow.

6. Section 02115 □ Embankment.

7. Section 02120 Excavation and Backfill for Structures.

8. Section 02125 Excavation and Backfill for Utilities.

9. Section 02130 Extra Unit Price Work for Excavation and Backfill.

10. Section 02135 Excavation for Roadway.

11. Section 02700 Cement-Stabilized Base Course.

12. Section 02705 Crushed Concrete Base Course.

13. Section 02715 Hot-Mix Asphaltic Base Course.

14. Section 02720 Lime-Stabilized Base Subgrade.

15. Section 02725 Portland Cement-Stabilized Base Subgrade.

16. Section 02800 Asphaltic Concrete Pavement.

17. Section 02805 Concrete Paving.

18. Section 02815 Headers, Curb, Curb and Gutter.

19. Section 02820 Concrete Sidewalks.

20. Section 02830 Concrete Driveways.

PART II: PRODUCTS

2.1 MATERIALS

A. Subgrade:

1. Provide backfill material as required by Sections 02110 Borrow, 02115 Embankment, 02120 Excavation and Backfill for Structures, 02125 Excavation and Backfill for Utilities, 02130 Extra Unit Price Work for Excavation and Backfill, and 02135 Excavation for Roadway.

2. Provide material for stabilization as required by applicable portions of Section 02720 Lime-Stabilized Base Subgrade and Section 02725 Portland Cement-Stabilized Base Subgrade.

B. Base: Provide base material as required by applicable portions of Section 02700 Cement-Stabilized Base Course Section 02705 Crushed Concrete Base Course and Section 02715 Hot-Mix Asphaltic Base Course.

C. Pavement: Provide paving materials as required by applicable portions of Section 02800 Asphaltic Concrete Pavement, Section 02805-Concrete Paving, Section 02830 Concrete Driveways and Section 02815 Headers, Curb, Curb and Gutter and Section 02820 Concrete Sidewalks.

PART III: EXECUTION

3.1 PREPARATION

A. Notify the Project Manager prior to commencement of excavation in pavement for which an Excavation in Public Right-of-Way permit has been obtained. Follow directions contained in the permit.

B. Conform to requirement of Section 02105 Removing Existing Pavements and Structures, for removals.

C. Saw cut pavement two feet (2 Ft) wider than width of trench needed to install utilities unless otherwise indicated on the Drawings.

D. When removing pavement to existing deformed metal strip (i.e. dummy joint), saw cut pavement a minimum of two inches (2 In) deep on opposite side of deformed metal strip. Place saw joint far enough behind deformed metal strip to obtain continuously straight joint. Remove damaged portion of deformed metal strip as required to provide proper joint. Saw cut and remove metal strip before placement of new concrete pavement.

E. Protect edges of existing pavement to prevent damage during removals, utility placement, backfill and paving operations. For concrete pavement, protect undisturbed subgrade that is to remain to support replacement slab.

F. Dowel-in to existing pavement where no reinforcement is found or is broken due to construction activities. Unless otherwise directed by the Project Manager, provide No. 6 (3/4 In) reinforcing bars twenty-four inches (24 In) long, drilled and embedded twelve inches (12 In) into center of existing slab with PO-ROC epoxy grout or approved equal. Space dowels to match new pavement reinforcement spacing.

G. Provide transitional paving, additional base depth and undercutting of

existing pavement as required to tie proposed pavement to existing pavement when unable to dowel new pavement into existing pavement.

H. Temporarily fill hole with base material or bridge with three-quarter inch (3/4 In) steel plates until ready to place concrete.

3.2 INSTALLATION

A. Parking Areas, Service Drives, Driveways and Sidewalks: Replace with material equal to or better than existing or as indicated on the Drawings. Conform to applicable requirements of sections referenced in Paragraph 2.1, Materials.

B. Street Pavements and Curbs, Curbs and Gutters: Replace subgrade, base and surface course with like materials or as indicated on the Drawings and the City of Friendswood Standard Details and Technical Specifications. Curbs and curbs and gutters shall match existing. Conform to requirements of sections referenced in Paragraph 2.1, Materials.

C. For concrete pavement, install size and length of reinforcing steel and pavement thickness indicated on the Drawings and the City of Friendswood Standard Details and Technical Specifications. Place types and spacing of joints to match existing joints or as indicated on the Drawings.

D. Where existing pavement consists of concrete pavement with asphaltic surfacing, resurface with a minimum of two inch (2 In) depth asphaltic pavement.

E. Repair TxDOT highway and county crossings in accordance with TxDOT permit or county requirements as appropriate, and within one week (1 Wk) after utility work is complete or pavement removal in cases of pavement repair only.

3.3 WASTE MATERIAL DISPOSAL

A. Dispose of waste material in accordance with requirements of Section 01580 Waste Material Disposal.

3.4 PROTECTION

A. Maintain pavement in good condition until completion of the Work.

B. Replace pavement damaged by the Contractor's operations at no cost to the City.

END OF SECTION

SECTION 02850

BLAST CLEANING OF PAVEMENT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Removal of existing pavement markings.

B. Preparation of pavement surfaces for new pavement markings.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for blast cleaning of roadway lanes is on a linear foot basis for each width, measured in place.

2. Payment for blast cleaning of symbols and legends is on a per legend or symbol basis, for each type of group of symbols or legends.

3. Payment for removal of raised pavement markings, all types, is on a lump sum basis.

4. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit description and characteristics of proposed blasting medium and equipment for approval.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

PART II: PRODUCTS

2.1 MATERIALS

A. Blasting Media: Quality commercial product capable of producing specified surface cleanliness without deposition of deleterious materials on cleaned pavement surface. Do not use high silica content sand particles as blasting agent that may result in high levels of free crystalline silica dust.

2.2 EQUIPMENT

A. Equipment shall be power-driven and of sufficient capacity to remove pavement markings. Equipment shall utilize moisture and oil traps of sufficient capacity to remove contaminants from air and prevent deposition of moisture, oil or other contaminants on pavement surface.

PART III: EXECUTION

3.1 REMOVAL OF EXISTING MARKINGS

A. Remove pavement markings in a sequence that shall prevent driver confusion or where indicated on the Drawings. Included are areas where it shall be necessary for drivers to cross existing markings which they would not normally cross. Completely remove or obliterate markings. Do not damage pavement surface.

3.2 CLEANING FOR PLACEMENT OF MARKERS

A. Remove old pavement markings, loose material and other contaminants deleterious to adhesion of new pavement markings to be placed. On Portland cement concrete pavement, minimize over-blasting to prevent damage to pavement surface. Small particles of tightly adhering existing pavement markings may remain, as approved by the Project Manager, if complete removal shall result in pavement surface damage.

B. Follow manufacturer's written instructions for proper cleaning of pavement surfaces to receive pavement marking.

END OF SECTION

SECTION 02855

RAISED PAVEMENT MARKERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Raised reflective pavement markers and jiggle bars.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Type I raised reflective pavement markers with one (1) reflective face is per each marker installed.

2. Payment for Type I raised reflective pavement markers with two (2) reflective faces is per each marker installed.

3. Payment for Type I raised pavement markers with no reflective face is per each marker installed.

4. Payment for Type II raised reflective pavement markers with one (1) reflective face is per each marker installed.

5. Payment for Type II raised reflective pavement markers with two (2) reflective faces is per each marker installed.

6. Payment for Type "W" jiggle bars is on a unit price basis per each jiggle bar.

7. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM □ American Society for Testing and Materials.

1. ASTM D2444 □ Standard Test Method for Determination of

Impact Resistance of Thermoplastic Pipe and Fittings by means of a Tup (Falling Weight).

2. ASTM E808 – Standard Practice for Describing Retroreflection.

3. ASTM E809 – Standard Practice for Measuring Photometric Characteristics of Retroreflectors.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 02850 – Blast Cleaning of Pavement.

C. Federal Specification L-P-380C – Plastic Molding Material Methacrylate.

D. TxDOT – Texas Department of Transportation.

1. TxDOT Material Specification DMS-4100 – Jiggle BarTile.

2. TxDOT Material Specification DMS-6130 – Bituminous Adhesive for Pavement Markers.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit manufacturer's product data concerning following materials for approval:

1. Types I, II and III, W and Y markers.

2. Primers, solvents and adhesives.

3. Installation instructions.

C. Submit certificate by manufacturer that each marker and adhesive conforms to requirements in this Section.

D. Submit details of manufacturer's replacement policy for each type and class of marker.

1.5 DELIVERY AND STORAGE

A. Deliver markers in cartons of one hundred (100) units and epoxy adhesive in one gallon (1 Gal) pails. Ship like materials in like-sized containers to facilitate storage.

B. Store material in cool, dry conditions until application.

PART II: PRODUCTS

2.1 MARKERS

A. Raised Reflective Pavement Markers: Shallow frustum of pyramid shaped markers with tempered glass prismatic reflective elements. Bodies shall be plastic shells with resin/sand fillings or single-piece injection-molded bodies of impact resistant polymers. Plastic shells shall be Methyl Methacrylate conforming to Federal Specification L-P-380C, Type I, Class 3 and shall have a minimum wall thickness of sixty-five hundredths of an inch (0.65 In).

B. Marker configuration shall be as specified in Table 4.1 RAISED PAVEMENT MARKER CONFIGURATIONE FOR TYPES I, II AND III.

C. Optical performance for Type I or II Raised Pavement Markers shall be as specified in Table 4.2 RAISED PAVEMENT MARKER OPTICAL PERFORMANCE FOR TYPES I AND II.

D. Optical performance for Type III Raised Pavement Markers shall be as specified in Table 4.3 RAISED PAVEMENT MARKER OPTICAL PERFORMANCE FOR TYPES III.

E. Testing Procedure: Locate randomly selected test marker with center of reflecting face five feet (5 Ft) from uniformly bright light source with effective diameter of two-tenths of an inch (0.2 In). Use photocell width of five hundredths of an inch (0.05 In) for Type I markers and photocell with annular ring of thirty-seven hundredths of an inch by forty-six hundredths of an inch (0.37 In x 0.46 In) for Type II markers; shield to eliminate stray light. Distance from light source to photocell center of twenty-one hundredths of an inch (0.21 In). Modify source receiver dimensions and distance between source and receiver proportionally to test distance change for test distances other than five feet (5 Ft). Lots containing more than four percent (4%) reflecting face failures shall be rejected according to ASTM E808 and ASTM E809.

F. Physical requirements shall be in accordance with following test procedures:

1. Type I and Type III Markers: Select three (3) random markers per lot. Center marker over open end of vertically positioned one inch (1 In) long hollow metal cylinder with three inch (3 In) inside diameter and twenty-five hundredths of an inch (0.25 In) wall thickness. Apply load slowly to top of marker through one inch (1 In) diameter by one inch (1 In) high metal plug centered on marker. Breakage or appreciable deformation of test sample at a load less than two thousand pounds (2000 Lbs) shall be cause for lot rejection.

2. Type II Markers: Select twenty (20) random markers per lot. Condition markers in convection oven at one hundred thirty degrees Fahrenheit (130° F) for one hour (1 Hr). At elevated temperature, impact reflective face by dropping ninety gram (90 g) dart, fitted with twenty-five hundredth of an inch (0.25 In) radius spherical head, six inches (6 In) perpendicularly onto center of reflective surface. Cracks in impact surface area shall be generally concentric in appearance. Small radial cracks less than twenty-five hundredth of an inch (0.25 In) in length shall be allowed. Lot shall be acceptable when eighteen (18) test samples meet testing requirements. The failure of four (4) test samples shall cause lot rejection. Retest additional twenty (20) markers when three (3) samples from the first (1st) group fail. The failure of one (1) lens of re-sample group shall cause lot rejection.

G. Impact Resistance: Test in accordance with ASTM D2444 Tup A.

H. Jiggle Bar Tile, Class A, shall conform to TxDOT Material Specifications D-9-4100 and includes Types I-A, I-C, II-A-A, W and Y.

1. Type I-A shall contain approach face that reflects amber light. Body, other than reflective face, shall be yellow.

2. Type I-C shall contain approach face that reflects white light. Body, other than reflective face, shall be white, silver-white or light gray.

3. Type II-A-A shall contain two (2) reflective faces (approach and trailing) each of which shall reflect amber light. Body, other than reflective faces, shall be yellow.

4. Type W shall have white body and no reflective faces.

5. Type Y shall have yellow body and no reflective faces.

6. Adhesive:

   a. Bituminous adhesive conforming to TxDOT material Specification D-9-6130 shall be used for Class A type markers on bituminous pavements.

   b. Epoxy adhesive for Class A type markers on Portland cement concrete pavements.

   c. Adhesives for installation of jiggle bar shall be as recommended by manufacturer.

2.2 ADHESIVE

A. Obtain two (2) component epoxy adhesive from reflective pavement marker manufacturer which conforms to manufacturer's requirements for installation for Class A, B, C and D markers on Portland cement concrete pavements.

B. Provide bituminous adhesive per TxDOT Material Specification D-9-6130 and which conforms to manufacturer's requirements for installation for Class A, B, C and D markers on bituminous pavements.

PART III: EXECUTION

3.1 PREPARATION

A. Accurately locate and install approved markers to conform to classes and colors indicated on the Drawings.

B. Clean and repair surfaces to receive markings. Remove loose material, dust and contaminants such as oil, curing membrane or polished aggregates.

C. Blast clean surfaces indicated on the Drawings or where directed by the Project Manager in accordance with requirements of Section 02850 - Blast Cleaning of Pavement. Do not clean Portland cement concrete pavements by grinding. Mechanical wire brushing may be used to remove curing membranes.

3.2 INSTALLATION

A. Prepare pavement surfaces and install markers in accordance with marker and adhesive manufacturer's recommendations.

B. Test pavement surface for moisture content prior to application of markings. Place approximate two square foot (2 Sf) sheet of clear plastic or tar paper on road surface and hold in place for twenty minutes (20 Min). Immediately inspect sheet for build up of condensed moisture. When sufficient moisture has condensed to cause water to drip from sheet, do not apply markings. Repeat test as necessary until sufficient moisture has evaporated from pavement to allow placement.

C. Observe manufacturer's recommended pavement and ambient air temperature requirements for application. When manufacturer has no temperature recommendations, do not install markings when pavement surface temperature is below sixty degrees Fahrenheit (60° F) or above one hundred twenty degrees Fahrenheit (120° F).

D. Position reflective face of markers so that direction of reflection of one (1) face is directly opposite to direction of reflection of other face and parallel to centerlines of street.

E. Prepare surfaces to which markers are to be attached by adhesive by a method to ensure that surface is free of dirt, curing compound, grease, oil, moisture, loose or unsound pavement markings and other materials which would adversely affect adhesive bond.

F. Establish guides to mark lateral location of pavement markings as shown on drawings. Guides placed on roadway for alignment purposes shall not establish permanent marking on roadway.

G. Place pavement markings in alignment with guides. Deviation rate in alignment shall not exceed one inch (1 In) per two hundred feet (200 Ft) of roadway. A maximum deviation shall not exceed two inches (2 In) nor shall deviation be abrupt. Remove and replace markings that are out of alignment or proper sequence.

H. Apply adhesive in sufficient quantity to ensure adhesion and as recommended by manufacturer for installation.

I. Markers shall be free of rust, scale, dirt, oil, grease, moisture or contaminants which might adversely affect adhesive bond.

J. Adhesive or other materials that impair functional reflectivity shall not be acceptable.

K. Place markers immediately after adhesive is applied and set into adhesive. Pavement markers shall not be in contact with pavement surface but shall be seated on continuous layer of adhesive. One hundred percent (100%) of bonding area of marker shall be in contact

with adhesive.

L. For Bituminous adhesive use, pavement and pavement marker temperature shall be at least forty degrees Fahrenheit (40° F). Do not heat Bituminous adhesive to temperature greater than four hundred degrees Fahrenheit (400° F). Agitate Bituminous adhesive immediately to ensure even heat distribution.

M. Prime pavement surface and apply markings as recommended by manufacturer.

3.3 CLEANING

A. Keep project site free of unnecessary traffic hazards at all times.

B. Clean area upon completion of the Work and remove rubbish from the work site.

3.4 WARRANTY

A. Warrant material and labor for period of twelve months (12 Mos) from date of installation of markings.

PART IV: TABLES

4.1 RAISED PAVEMENT MARKER CONFIGURATIONE FOR TYPES I, II AND III.

RAISED PAVEMENT MARKER CONFIGURATION			
MARKER	**NOMINAL DIMENSIONS**	**REFLECTING FACE SLOPE**	**REFLECTING FACE SURFACE AREA**
Type I	4□x 4□x 0.75 high	30°	3.25 sq. in.
	3□x 5□x 0.70 high	30°	4.00 sq. in.
Type II	2□x 4□x 0.40 high	30°	1.87 sq. in.
Type III	3□x 5□x 0.70 high	30°	4.00 sq. in.

4.2 RAISED PAVEMENT MARKER OPTICAL PERFORMANCE FOR TYPES I AND II.

TYPE I AND II RAISED PAVEMENT OPTICAL PERFORMANCE			
SPECIFIC INTENSITY, SI, MIN.	**WHITE**	**YELLOW**	**RED**
Entrance Angle = 0°	15.0	9.0	3.5
Entrance Angle = 20°	6.0	3.6	1.2

4.3 RAISED PAVEMENT MARKER OPTICAL PERFORMANCE FOR TYPES III.

TYPE III RAISED PAVEMENT OPTICAL PERFORMANCE			
SPECIFIC INTENSITY, SI, MIN.	**WHITE**	**YELLOW**	**RED**
Entrance Angle = 0°	15.0	9.0	3.5
Entrance Angle = 20°	6.0	3.6	1.2

END OF SECTION

SECTION 02860

THERMOPLASTIC PAVEMENT MARKINGS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. This item includes white or yellow thermoplastic pavement markings for crosswalks, stop lines, lane lines, edge lines and other types of traffic controls.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for thermoplastic pavement markings is on a linear foot basis for the width of markings.

2. Payment for words and symbols is per each word or symbol.

3. Unit price bid for each shall be item full compensation for furnishing and placing all materials and for all manipulations, including blast cleaning, surface sealing and priming, labor, tools, equipment and incidentals necessary to complete the Work in accordance with drawings and Technical Specifications.

5. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. When Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Standards for Testing and Materials.

1. ASTM E28 Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus.

2. ASTM G152 Standard Practice for Operating Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

3. ASTM G153 – Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

C. TxDOT – Texas Department of Transportation.

1. TxDOT Tex-822-B – Determining Refraction Index of Glass Beads.

2. TxDOT Tex-826-B – Water Absorption Test of Beads.

3. TxDOT Tex-839-B – Determining Color in Reflective Material.

4. TxDOT Tex-851-B – Evaluating the Abrasion Resistance of Pavement Marking Material.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Product Data: Submit Manufacturer's literature indicating product specifications and instructions for handling, installation and curing. Include performance test data sheets for each product.

C. Submit material supplier's certification of compliance with the Technical Specifications.

D. Submit proposed methods, equipment and sequence of operation for layout, surface preparation and installation.

E. Chemical Analysis: Submit infrared analysis of Type B resins for each manufacturer used.

PART II: PRODUCTS

2.1 MATERIAL REQUIREMENTS

A. General Requirements: Especially compound Type B thermoplastic pavement marking material for use on either asphaltic or Portland

cement concrete surfaces. Clearly mark each container to indicate color, weight, type of material and lot or batch number (consider lot or batch as each individual mix or blend that produces finished product ready for use). Package material in either suitable corrugated containers or thermal degradable plastic bags to avoid sticking during shipment or storage.

B. Thermoplastic markings shall not be slippery when wet, and shall not exhibit tacky, exposed surface. Cold ductility of material shall permit normal road surface expansion and contraction without chipping or cracking. Markings shall retain their original color, dimensions and placement under normal traffic conditions at road surface temperatures of one hundred fifty-eight degrees Fahrenheit (158° F) and below.

C. Prime and filler pigments shall pass U.S. Standard sieve No. 230 (0.0024 inch opening) when washed free of resins by solvent washing and meet following specific requirements for each pigment.

1. Prime Pigments: White pigment shall be Rutile Titanium Dioxide. Yellow pigment shall be a heat-resistant, double-encapsulated medium chrome yellow or other approved heat-resistant pigment.

2. Filler Pigment: Filler pigment shall be calcium carbonate, with a purity of ninety-five percent (95%).

D. Binder

1. Type B Alkyd: Use binder consisting of mixture of resins, at least one (1) of which is solid at room temperature and high boiling point plasticizers. At least one-third (1/3) of binder compositions shall be a maleic-modified glyceryl ester 012 Rosin and shall be no less than eight percent (8%) by weight of entire material formulation.

E. Glass Traffic Beads: The total silica used in formulation shall be in the form of glass traffic beads meeting the following requirements:

1. Manufacture: Use glass traffic beads having the following characteristics:

a. Manufactured from glass;

b. Spherical in shape;

c. Free of sharp angular particles;

d. Free of particles showing milkiness, surface scoring or surface scratching;

e. Water white in color.

2. Contaminants: Use glass traffic beads having the following characteristics:

a. Containing less than one-quarter of one percent (0.25%) moisture by weight;

b. Free of trash, dirt, etc;

c. Showing no evidence of objectionable static electricity when flowing through traffic-bead dispenser.

3. Gradation:

a. Sieve Analysis: Glass traffic beads shall meet gradation requirements specified in TABLE 4.1 GLASS TRAFFIC BEADS SIEVE ANALYSIS, in this Section.

b. Irregular Particles: Glass traffic beads, retained on screen used to determine gradation requirements, shall contain not more than thirty percent (30%) (by weight) of irregular particles.

4. Index of Refraction: Glass traffic beads, when tested by TxDOT Tex-822-B, using liquid immersion method at seventy-seven degrees Fahrenheit (77° F) shall show index of refraction within range of 1.50 to 1.53.

5. Wetting: Use glass traffic beads capable of being readily wet with water when tested in accordance with TxDOT Tex-826-B.

6. Stability: Use glass traffic beads showing no tendency toward decomposition, surface etching, change in retro-reflective characteristics or change in color after:

a. One hour (1 Hr) exposure to concentrated hydrochloric acid at seventy-seven degrees Fahrenheit (77° F);

b. Twenty-four hour (24 Hr) exposure to weak alkali;

c. One hundred hours (100 Hrs) of Weather-O-Meter exposure, in accordance with ASTM G152 and ASTM G153.

2.2 FINISHED PRODUCT REQUIREMENTS

A. Physical Characteristics: Finished thermoplastic pavement markings material shall be free-flowing granular material, unless otherwise shown on the Drawings. Material shall remain in free flowing state in storage at temperatures of one hundred degrees Fahrenheit (100° F) or less. Materials shall be readily sprayed through nozzles commonly used on thermoplastic spray equipment at temperatures between four hundred one degree Fahrenheit (401° F) to four hundred twenty-five degrees Fahrenheit (425° F).

B. Toxicity: At temperatures up to and including four hundred forty-six degrees Fahrenheit (446° F), materials shall not give off fumes which are toxic and otherwise injurious to persons, animals or property.

C. Material shall not break down or deteriorate when held at four hundred one degrees Fahrenheit (401° F) for four hours (4 Hrs).

D. Temperature versus viscosity characteristics of material in plastic state shall remain constant throughout up to four reheatings at four hundred one degrees Fahrenheit (401° F) and from batch to batch.

E. Material shall not be adversely altered by contact with sodium chloride, calcium chloride or other similar chemicals on or used on, roadway surface; by contact with oil content of pavement materials or by contact from oil dropping from traffic.

F. Softening Point: After heating thermoplastic materials for two hours (2 Hrs) at four hundred degrees Fahrenheit (400° F) Type B Alkyd material shall have softening point greater than 194 degrees Fahrenheit when tested in accordance with ASTM E28-58T Ball and Ring Method.

G. Color: CIE chromaticity coordinates of materials, when determined in accordance with TxDOT Tex-839-B, shall fall within area having following corner points and shall meet luminosity requirements specified in TABLE 4.2 CIE CHROMATICITY COORDINATE CORNER POINTS LUMINISITY REQUIREMENTS, in this Section. Material shall meet above specified color requirements, before and after seventy hours (70 Hrs) of exposure in Weather-O-Meter (Atlas, Sunshine Type) fitted with [eighteen minutes (18 Min) sunshine and rain to one hundred two minutes (102 Min) of sunshine] cyclic gear. Prepare panels for

testing with material as supplied.

H. Abrasion: Thermoplastic pavement marking materials shall have loss between four grams (4 g) and twelve grams (12 g) when tested for abrasion in accordance with TxDOT Tex-851-B. Test according to steps one (1) through eight (8) of procedure utilizing test parameters specified in TABLE 4.3 ABRASION TEST FOR THERMOPLASTIC PAVEMENT MARKING MATERIALS, in this Section.

I. Uniformity: Manufacture material so that, when sampled in accordance with TxDOT Manual of Testing Procedures, a one hundred gram (100 g) sample shall be representative of the batch or lot of material.

J. When applied one-eighth inch (1/8 In) thick, setting time shall not exceed characteristic straight-line curve lower limit which is four minutes (4 Min) at fifty-nine degrees Fahrenheit (59° F) road surface temperatures and upper limit of which is ten (10) minutes at ninety degrees Fahrenheit (90° F) road surface temperature. Both temperatures are to be measured at a maximum relative humidity of ninety percent (90%).

2.3 FORMULAE

A. Type B Alkyd Thermoplastic Marking shall be as specified in TABLE 4.4 TYPE B ALKYD THERMOPLASTIC MARKING FORMULA, in this Section.

PART III: EXECUTION

3.1 GENERAL

A. Spray apply pavement marking or extrude hot material to pavement surface unless application method is specified on the Drawings.

B. Provide continuous mixing and agitation of material. Provide clean, square, marking ends. Do not use pans, aprons or similar appliances which die overruns.

C. Provide thermometer capable of measuring temperature of pavement marking material.

D. Use automatic bead dispenser attached to pavement marking equipment in manner that beads are dispensed uniformly and almost instantly upon marking as marking is being applied to road surface. Rate of application shall be sufficient to achieve retro-reflective characteristics specified. Provide automatic cut-off control for bead

dispenser, synchronized with cut-off of pavement marking application process.

E. Place markings in accordance with approved traffic control plan so that minimal interruption to traffic flow is achieved, or so that driver confusion is minimized. Protect newly-installed pavement markings from damage by traffic.

F. Apply pavement markings onto clean, dry pavement having road surface temperature above sixty degrees Fahrenheit (60° F). When pavement marking application is by spray and operations cease for five minutes (5 Min) or more, flush spray head by spraying pavement marking material into pan or similar container until material is proper temperature for application.

G. Use markings that are completely reflectorized internally and externally.

H. Use crew experienced in the Work of installing pavement markings and supply all equipment and materials necessary for placement of pavement markings.

I. Apply material within temperature limits recommended by manufacturer.

J. Prior to placement of thermoplastic material, properly prepare pavement with primer.

3.2 LAYOUT

A. Place pavement markings in proper alignment with guidelines established on roadway. Do not deviate from alignment established greater than two inches (2 In). Do not deviate in alignment of marking being placed greater than one inch (1 In) per two hundred feet (200 Ft) of marking and do not deviate abruptly.

B. Place additional markings required to achieve alignment specified throughout both straight and horizontally curved sections of roadway. Additional markings placed on roadway for alignment purposes shall be temporary in nature and shall not be established as permanent marking on roadway. Materials used for alignment markings and equipment used to place markings shall be approved by the Project Manager.

3.3 SURFACE PREPARATION

A. Clean pavement by sandblasting and prepare in accordance with recommendations of thermoplastic material manufacturer and to

satisfaction of the Project Manager prior to placement of markings. Surface scarification can be used with prior approval of the Project Manager.

B. Use cleaning methods approved by the Project Manager that completely remove contaminants, loose materials and conditions deleterious to proper adhesion. Do not clean Portland cement concrete surfaces by grinding.

C. Further prepare Portland cement concrete surfaces after cleaning by completely sealing with epoxy or methyl methacrylate sealer as recommended by thermoplastic material manufacturer. Place sealer sufficiently in advance of thermoplastic to allow release of all solvents.

D. Prime asphaltic surfaces with sealer as recommended by thermoplastic material manufacturer and based on surface conditions. Include adhesive or adhesion promoter when asphaltic surfaces exhibit polished aggregate.

3.4 INSTALLATION

A. Install in widths of four inches (4 In), six inches (6 In), eight inches (8 In) or twelve inches (12 In) or shape as otherwise shown on the Drawings. Tolerances in width shall not exceed one-eighth inch (1/8 In). Tolerance shall not exceed one-quarter inch (1/4 In) in case of undulation in pavement.

B. Material shall not prohibit adhesion of other thermoplastic markings if, at some future time, new markings are placed over or across existing materials.

C. Maintain uniform thickness of each pavement marking. The minimum thickness of markings, as measured above plane formed by pavement surface, shall not be less than one-eighth inch (1/8 In), one hundred twenty-five mils (125 mils), unless shown otherwise on the Drawings. The maximum thickness shall be three-sixteenths inch (3/16 In). Supply device approved by the Project Manager to measure thickness of applied extruded markings.

3.5 TESTING

A. Maintain uniform cross section, density, quality and thickness for markings. Markings shall be uniform throughout their thickness. Use applied markings that are ninety-five percent (95%) free of holes and voids and free of blisters for a minimum of sixty days (60 D) after application.

PART IV: TABLES

4.1 GLASS TRAFFIC BEADS SIEVE ANALYSIS

OPENINGS U.S. STANDARD SIEVES	PERCENT PASSING
No. 20	95 □100
No.30	80 □95
No. 50	15 □35
No. 100	0 □4

4.2 CIE CHROMATICITY COORDINATE CORNER POINTS LUMINISITY REQUIREMENTS

	POINT 1	POINT 2	POINT 3	POINT 4	
Color	X Y	X Y	X Y	X Y	Luminosity
White {tc \ 12□ White}	0.290 □ 0.315	0.310 □ 0.295	0.350 □ 0.340	0.330 □ 0.360	Minimum 65

4.3 ABRASION TEST FOR THERMOPLASTIC PAVEMENT MARKING MATERIALS

THERMOPLASTIC MARKINGS TEST PARAMETERS	
TEST PARAMETERS	**VALUE**
Test Distance	5 Inches
Blast Pressure	40 psi
Sample Angle	10° and 122 gram blast media
Blast Media	1200 grams

4.4 TYPE B □ALKYD THERMOPLASTIC MARKING FORMULA

MATERIAL	POUNDS
Binder	18 □23
Titanium Dioxide	12 □15
Calcium Carbonate	20 □42
Glass Traffic Beads	30 □45
TOTAL	100

END OF SECTION

SECTION 02865

TRAFFIC SIGNS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for furnishing and installing signs for traffic control.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for traffic signage is on a per each basis per sign type.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

3. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

4. ASTM B449 Standard Specification for Chromates on Aluminum.

5. ASTM B695 Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

6. ASTM D4956 Standard Specification for Retroreflective

Sheeting for Traffic Control.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01430 Project Signage.

4. Section 03300 Structural Concrete.

C. TxDOT Texas Department of Transportation.

1. Department of Materials Specification DMS-7110 Aluminum Sign Blanks.

2. Department of Materials Specification DMS-8300 Sigh Face Materials.

3. Standard Specifications for Construction of Highways, Streets and Bridges Item 636 Aluminum Signs (Type A).

4. Texas Manual on Uniform Traffic Control Devices (TMUTCD), Latest Edition.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit manufacturer s product data concerning following materials for approval:

1. Sign Blanks.

2. Facing materials.

3. Mounting hardware and poles.

C. Submit manufacturer s certification that all signage meets requirements in this Technical Specification.

PART II: PRODUCTS

2.1 ALUMINUM SIGN BLANKS

A. Aluminum sheet or coil sign blanks shall meet all requirements of TxDOT Standards Specification Item 636, TxDOT DMS-7110 Aluminum Sign Blanks and ASTM B209, Alloys 6061-T-6 or 5052-H38.

B. Sign blanks made from sheet or coil shall be free of buckles, warps, dents, cockles, burrs and other defects and must be a plane surface. Sign blank thickness shall be eight-hundredths inch (0.08 In) in thickness.

C. Treat all sign blanks fabricated from sheet and coil with a chromate chemical process resulting in a coating meeting the requirements of ASTM B449, Class 2. The coating shall be light colored, tight and free from powdery residues.

D. Manufacturer shall furnish mill test reports for aluminum sheet or coil which reflect the chemical and physical properties of the aluminum.

2.2 SIGN MOUNTING HARDWARE AND ADHESIVES

A. All material for sign posts and mounting hardware shall be galvanized Steel and be in compliance with ASTM A307, ASTM A153 and ASTM B695.

B. Sign posts shall be two and three-eighths inches (2-3/8 In) in outside diameter galvanized steel.

C. Sign Post mounting shall be Pos-Lok or equal system consisting of sixteen inch (16 In) sleeve and removable wedge.

D. Pipe and post clamp castings and miscellaneous fasteners shall be verified by manufacturer's certifications stating that the material meets all applicable requirements.

2.3 FACE MATERIALS

A. All materials are to be certified by lot or shipment that material supplied meets requirements listed in these Specifications. Material shall also comply with ASTM D4956 and TxDOT DMS 8300.

B. Sign face materials shall be processed, applied and stored according to the manufacturer's recommendations. Sign face materials shall

perform for a minimum of ten years (10 Yrs).

C. The Project Manager shall reject any sign and or face material for the following reasons:

1. Cracks discernible with the unaided eye from the drivers position while in an outside lane at a distance of fifty feet (50 Ft) or greater from the sign.

2. Peeling in excess of one-quarter inch (1/4 In).

3. Shrinkage in excess of one-eighth inch (1/8 In) total per forty-eight inches (48 In) of sheeting width.

4. Fading or loss of color to the extent that color fails to meet the requirements of ASTM D4956 or TxDOT DMS 8300.

5. In non-construction zone loss of reflectivity to a level eighty percent (80%) of the minimum values as specified in ASTM D4956.

6. In construction zone loss of reflectivity to a level sixty percent (60%) of the minimum values as specified in ASTM D4956.

7. Face consists of pressure-activated material of either diamond or prismatic vinyl.

2.4 STREET NAME SIGNS

A. Street name signs shall conform to the applicable City of Friendswood Standard Details, and to TxDOT Specifications where applicable.

PART III: EXECUTION

3.1 INSTLLATION

A. All signs and their installation shall be accordance with the latest edition of the TMUTCD Texas Manual on Construction Traffic Control Devices (TMUTCD).

B. All signs shall be installed at the locations shown on the Drawings or as directed by the Project Manager.

C. Sign Posts shall be set a minimum of three feet (3 Ft) in depth in a twelve inch (12 In) diameter hole filled with concrete as specified in

Section 03300 □ Structural Concrete.

D. All installation and materials shall conform to all applicable requirements specified in Section 01430 □ Project Signage.

END OF SECTION

SECTION 02870

CONCRETE SLAB RAISING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Hydraulic pressure jacking of concrete slabs to correct slab profile. Jacking is accomplished by drilling injection holes and pumping a cement/fly ash slurry or polyurethane (foam) under the slab.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for boring, drilling, pumping of cementatious grout slurry or polyurethane formulation filler and shall be incidental to this Specification. Measurement shall be per Square Yard or portion thereof, as measured between Construction Joints. Payment shall be in accordance with Measurement and Payment for work as required in appropriate sections.

2. Refer to Section 01270 Measurement and Payment for other unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO American Association of State Highway and Transportation Officials.

1. M-295 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

2. T-26 Standard Method of Test for Quality Water to Be Used in Concrete.

B. ACI American Concrete Institute

1. 304.6R Guide for Use of Volumetric-Measuring and Continuous-Mixing Concrete Equipment.

C. ASTM American Society for Testing and Materials.

1. C-94 Standard Specification for Ready-Mixed Concrete.

2. C-150 Standard Specification for Portland Cement.

3. C-685 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

4. C-939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

5. C-942 Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.

6. D-1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

7. D-1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.

C. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01580 Waste Material Disposal.

4. Section 02805 Concrete Paving.

5. Section 03105 Grout.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit for approval, materials proposed for use. Submittal shall include mill certification for cement, physical and chemical analysis for fly ash, tests if the grout slurry by an independent testing laboratory that conforms to Section 01470 Testing Laboratory Services.

1. Tests shall show one (1), three (3) and seven (7) day strengths, flow cone times, shrinkage, and expansion observed, and time of initial set. The seven (7) day strength shall be at least six hundred pounds per square inch (600 psi) as measured in accordance with ASTM C-942.

PART II: PRODUCTS

2.1 CEMENT SLURRY MATERIALS

A. Fluidity of the grout when measured by a flow cone in accordance with ASTM C-939 shall have a time efflux between sixteen (16) and thirty-six (36) seconds. During initial injection at each hole an efflux time between nine (9) and fifteen (15) seconds will be permitted. The use of material with and efflux time between nine (9) and fifteen (15) seconds shall be discontinued prior to movement of the slab. The Contractor shall be required to perform this test prior to placing any material.

B. Portland Cement: Portland Cement shall be Type 1A conforming to ASTM C-150 Standard Specification for Portland Cement.

C. Fly Ash: Class C fly ash conforming to AASHTO M-295 shall be used in grout for pavement jacking, undersealing or when specified. Fly Ash shall be from approved base loaded electric generating plants using a single coal source. Plants using a limestone injection process for controlling air pollutants are not acceptable. Fly ash from start up and shut down of plant shall not be used. The total of silicon dioxide (SiO_2) plus aluminum oxide (Al_2O_3) plus iron oxide (Fe_2O_3) shall be at least sixty-six percent (66%) by dry weight of the total fly ash composition. The silicon dioxide (SiO_2) shall be at least forty percent (40%) by dry weight of the total fly ash composition.

D. Water: Clean, free from harmful amounts of oils, acids, alkalis, organic or other deleterious substances, and meeting requirements of ASTM C-94. Water from municipal supplies approved by State agencies will not require testing, but water from other sources shall be tested before use in concrete.

1. Tests shall be made in accordance with AASHTO T-26. One gallon (1 Gal) shall be taken to qualified testing laboratory for testing.

E. Mix Design: Cement Slurry Mix Design shall conform to the following TABLE 4.1 CEMENT SLURRY MIXTURE. There will be **NO** deviation from the approved mix design.

2.2 POLYURETHANE FORMULATION

A. Jacking Foam: Water blown formulation of high-density polyurethane. The high density, closed cell polyurethane shall be hydrophobic and shall exhibit the following physical characteristics as specified in TABLE 4.2 HIGH-DENSITY POLYURETHANE FOAM.

B. The polyurethane formulation shall have a free rise density of three (3.0) to three and two-tenths (3.2) pounds per cubic foot (lbs/cf), with a minimum compressive strength of forty pounds per square inch (40 psi). The material shall be resistant to oils, gasoline and most solvents.

C. The high-density polyurethane formulation shall reach ninety percent (90%) of full compressive strength within fifteen (15) minutes from injection.

2.3 EQUIPMENT

A. For Cement Slurry:

1. The grout plant shall consist of a positive displacement cement injection pump and a high speed colloidal mixing machine. The colloidal mixing machine shall operate between eight hundred revolutions per minute (800 rpm) and two thousand revolutions per minute (2,000 rpm), creating a high shearing action and subsequent pressure release to make a homogeneous mixture.

2. Mixing equipment shall be self-contained continuous mixer, with calibrated mixing and delivery systems, carrying all water, cement, aggregate for slurry mixes and foam for polyurethane mixes needed on the job site. The continuous mixer shall meet or exceed the Standards of Calibration set forth by the Volumetric Mixer Manufacture Bureau (VMMB), a member of the National Ready Mix Concrete Association (NRMCA), and conforming to ASTM C-685 and ACI 304.6R.

3. All materials pumped shall be a minimum of five hundred pounds per square inch (500 psi) to a maximum of one thousand pounds per square inch (1,000 psi).

B. For Polyurethane Formulation:

1. The pumping unit for polyurethane formulation shall be a truck-mounted pumping unit capable of injecting high-density polyurethane formulation between the concrete slab and the

subgrade and be capable of controlling the rate of rise of the slab. The pumping unit shall be equipped with a metering device to measure quantity of material pumped.

C. Drilling shall be accomplished using an air compressor and rock drills, or other devices capable of drilling the injection holes completely through the concrete slab.

D. A laser leveling unit shall be used to ensure that the concrete slab is raised to an even plane and to the required elevation.

PART III: EXECUTION

3.1 PREPARATION

A. Notify the Project Manager prior to commencement of any activities. Project Manager will verify the areas to be raised and the pattern for the drilling of the injection holes.

B. Slab jacking shall not be performed when the slab surface temperatures are below forty degrees Fahrenheit (40° F), or if the subgrade or base course is frozen. Slab jacking shall not be performed when the subgrade or base course contains an abnormal amount of moisture from recent rainfall, as evidenced by standing water on the slab, or in the joints, or cracks.

C. All materials for jacking operations shall be on site and mobile and not stored in the road or work area, unless approved by the Project Manager.

D. The Contractor shall not start any new location unless it can be completed in the same day.

E. The Contractor shall take all necessary precautions to prevent jacking material from entering areas such as pipes, culverts or any other area that is not designated for slab raising. If jacking material enters these areas the Contractor shall remove it to the satisfaction of the City.

3.2 DRILLING HOLES

A. When jacking slurry is specified, holes should be between one and one half inch (1-1/2 in) and two inches (2 in) in diameter, drilled vertically and round, to a depth sufficient to penetrate any stabilized base and into the subgrade material. Holes may be washed to create a small cavity, allowing initial spread of grout. Holes shall be drilled in a manner that prevents breakout at the bottom of the slab. The

downward force of the drill shall not exceed two hundred pounds (200 lbs).

B. When polyurethane formulation is specified, holes shall be five-eighths inch (5/8 in) in diameter, drilled vertically, and round to a depth sufficient to penetrate any stabilized base and in the subgrade material. Holes shall be drilled in a manner that prevents breakout of the slab.

3.3 CEMENT SLURRY JACKING

A. String lines shall be established and blocked up from pavement high points to monitor movement.

B. An expanding rubber packer or other approved device connected to the discharge from the plant shall be lowered into the hole. The discharge end of the packer shall not extend below the lower surface of the concrete slab.

C. The Contractor shall pump in a pattern and in the amount to raise the slab to within two-hundredths foot (0.02 ft) of specified grade. Grade tolerances are applicable to both transverse and longitudinal grades. After the pavement has been raised to the desired elevation, all holes shall be injected to ensure complete filling of voids.

D. Continuous pressure of up to two hundred pounds per square inch (200 psi) will be permitted. Pressures up to three hundred pounds per square inch (300 psi) will be allowed only for short periods. If the slab is bonded to the subgrade, brief pressure rises up to six hundred pounds per square inch (600 psi) ten seconds (10 sec) or less.

E. Mixed material shall not be held in the mixer or injection sump pump for more than one hour (1 HR) after mixing. Any material held longer than one hour (1 HR) shall be wasted and shall not be paid for. Additional water shall not be added after the initial mixing of the grout.

F. Excessive loss of the slurry through cracks, joints, other drilled holes, or from back pressure in the hose will not be tolerated and shall not be paid for.

G. If the Project Manager determines that continued slurry injection at a specific location is no longer feasible due to major voids, the Project Manager may direct the Contractor to cease slurry injection at that location.

H. Upon completion of jacking, holes shall be patched in conformity with the grout specifications in this Section.

3.4 POLYURETHANE FORMULATION JACKING

A. The high-density polyurethane formulation is to be injected under the slab. The amount of rise shall be controlled using the pumping unit and by regulating the rate of injection.

B. The Contractor shall inject in a pattern and in the amount required to raise the pavement to within two-hundredths foot (0.02 ft) of the specified grade. Grade tolerances are applicable to both transverse and longitudinal grades. A tight string line and/or laser level shall be used to monitor and verify elevations. After the slab has been raised to the desired elevation, all holes shall be injected to ensure complete filling of voids.

C. Excessive loss through cracks, joints, other drilled holes, or from back pressure in the hose will not be tolerated and shall not be paid for.

D. If the Project Manager determines that continued slurry injection at a specific location is no longer feasible due to major voids, the Project Manager may direct the Contractor to cease slurry injection at that location.

E. Upon completion of jacking, the upper two inches (2 in) of the drilled holes shall be patched in conformity with the grout specifications in this Section. The foam material shall; be removed from the injection hole appropriately to ensure a good bond between the grout and the in-place concrete.

3.5 DAMAGE

A. Radial Cracks: The slab shall not be raised more than one-quarter inch (1/4 in) while pumping in any one (1) hole at any one (1) time. Cracks emanating radially from the grout injection holes shall be presumed to have been caused by improper injection techniques by the Contractor and shall be repaired at no cost to the City.

B. Transverse Cracks: If cracks develop between adjacent injection holes, the Contractor shall repair the cracks at no cost to the City.

C. Slab Raised above Tolerance: Slabs raised above tolerance, shall be brought to grade by grinding. If over jacking is greater than one-tenth foot (0.10 ft), satisfactory removal, and replacement shall be required at no additional cost to the City.

D. Corrective actions for cracks shall be as those listed in Section 02805 □

Concrete Paving.

3.6 GROUT

A. Holes that have been used for injections sites will be grouted utilizing a mixture of Portland Cement Type I and Mason Sand in a two (2) to one (1) proportion. All grout shall be non-shrinkable and conform to Section 03105 Grout.

B. For cement slurry mixture the hole can be grouted as soon as the cement slurry has set. If the operations make it unfeasible to grout immediately after the slab has been raised, then the holes shall be cleaned using a wire brush or sand blasting the full depth of the slab to remove the excess of slurry, then grouted.

C. For polyurethane formulations the foam shall be removed from the top two inches (2 in) of the injection hole and filed with grout.

PART IV: TABLES

4.1 CEMENT SLURRY MIXTURE

MATERIAL	PERCENT PASSING	PERCENT OF MIXTURE
Lime/Fly Ash Mixture passing #50 Sieve	100%	27%
Sand Passing #4 Sieve	100%	15%
Ground clay passing #4 Sieve	100%	50%
Portland Cement, Type 1A, 3-1/2 bag mix (approx.)	N/A	8%
NOTE: Should Fly Ash and/or Lime not be readily available, increase the amount of Sand by 27%.		

4.2 HIGH-DENSITY POLYURETHANE FOAM

Density, LB/CF (ASTM D-1622)	Compressive Strength (ASTM D-1621)
3.0	40 psi
3.5	50 psi
4.0	60 psi
6.0	110 psi

END OF SECTION

SECTION 02900

TURF ESTABLISHMENT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Minimum requirements for acceptance of grass cover for erosion control.

B. Requirements for preparing ground, providing and planting St. Augustine grass, providing and distributing Fertilizer and subsequent watering.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Hydromulch seeding is on an acre basis.

2. Payment for sodding is on a square yard basis.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

C. Payment for all seeding either Hydromulch or Sodding shall be only to the extent of the limits in the Drawings. The Contractor shall replace all damaged ground cover outside of the limits shown on the Drawings at no cost to the City.

1.3 SUBMITTALS

A. The following submittals shall be made prior to beginning of turf establishment.

1. Vegetative Plan which shall include:

a. Seed bed preparation.

b. Method of seeding.

c. Seed.

d. Species.

e. Rate of application.

f. Optimum planting dates.

g. Seed quality requirements.

h. Fertilizer.

i. Nutrient ration required.

j. Schedule of application.

k. Rate of application.

l. Method of applications.

m. Weed control methods.

2. Extended maintenance plan.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 02905 Topsoil.

4. Section 02910 Hydromulch Seeding.

5. Section 02915 Sodding.

PART II: PRODUCTS

2.1. TOPSOIL

A. Topsoil that is either stripped and stockpiled or hauled in shall conform to Section 02905 Topsoil.

2.2 SOD

A. Sodding shall conform to Section 02915 □ Sodding.

2.3 Hydromulch Seed

A. Hydromulch seed shall conform to Section 02910 □ Hydromulch Seeding. Hydromulch seeding shall be appropriate for the season in which it is being applied.

2.4 FERTILIZER

A. Fertilizer shall be of nutrient ratio specified in Vegetative Plan. Bagged or bulk fertilizer will be acceptable. If bulk fertilizer is used, Vendor shall sign Invoice to certify analysis. Only free-flowing uncontaminated fertilizer will be acceptable. Fertilizer shall conform to the specifications of Sections 02910 □ Hydromulch Seeding and 02915 □ Sodding.

PART III: EXECUTION

3.1 GENERAL

A. Turf establishment shall begin as soon as practically and economically feasible after approval by the Project Manager.

B. Proceed with seeding when environmental conditions are favorable.

C. Repair erosion occurring after topsoil placement but before beginning turf establishment.

3.2 TOPSOIL

A. Strip topsoil and stockpile in conformance with Section 02905 □ Topsoil.

B. Place topsoil as shown in the Drawings to a depth of four inches (4 In) loose.

C. Do not under any circumstances, start fertilization and seeding before the topsoil has been approved by either a Landscape Architect or the Project Manager or both. Failure to get approval shall have all seeding and topsoil removed and replaced at no cost to the City.

3.2 PLANTING OPERATIONS

A. After topsoil placement and approval of the Project Manager, apply

fertilizer at a rate of eighty (80) □ eighty (80) per acre.

B. Disc fertilizer into seedbed.

C. Roll seedbed to compact soil.

D. Weed control shall be carried out during guarantee period as detailed in Vegetative Plan.

E. Rates, mixtures and techniques may be adjusted by Certified Professional Agronomist depending on season topsoil placement in completed with the approval of the Project Manager.

F. Plant San Augustine or Bermuda sod in residential areas and next to curb for erosion control in lieu of silt fencing.

G. Hydromulch all other areas not in residential areas with Bermuda seed mix.

H. Contractor shall guarantee at least ninety-five percent (95%) cover for grass in any ten square yard (10 Sy) area sampled at the end of one year (1 Yr) from date of acceptance of maintenance responsibility by the City. Any area that does not have grass cover at the end of guarantee period will be reestablished by Contractor at no additional cost to the Owner. The City shall not accept maintenance responsibilities until either the end of the one year (1 Yr) guarantee period or when grass covers at least ninety-five percent (95%) of the area; whichever is later.

END OF SECTION

SECTION 02905

TOPSOIL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Furnishing and placing topsoil for finish grading and for seeding, sodding and planting.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for topsoil under this Section. Include payment in Section 02910 □ Hydromulch Seeding or Section 02915 □ Sodding.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENECES

A. CFTS □ City of Friendswood Technical Specifications.

1. Section 01270 □ Measurement and Payment.

2. Section 01330 □ Submittal Procedures.

3. Section 01580 □ Waste Material Disposal.

4. Section 02135 □ Excavation for Roadway.

5. Section 02140 □ Utility Backfill Materials.

6. Section 02910 □ Hydromulch Seeding.

7. Section 02915 □ Sodding.

PART II: PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be fertile, friable, natural sandy loam surface soil obtained from excavation or borrow operations having characteristics specified in TABLE 4.1 TOPSOIL CHARACTERISTICS in this Section.

B. Topsoil shall be reasonably free of subsoil, clay lumps, weeds, non-soil materials and other litter or contamination. Topsoil shall not contain roots, stumps and stones larger than two inches (2 In).

C. Obtain topsoil from naturally well-drained areas where topsoil occurs at a minimum depth of four inches (4 In) and has similar characteristics to that found at placement site. Do not obtain topsoil from areas infected with growth of or reproductive parts of nut grass or other noxious weeds.

PART III: EXECUTION

3.1 EXAMINATION

A. Excavate topsoil for esplanades and areas to receive grass or landscaping from areas to be further excavated. Stockpile in area approved by the Project Manager.

B. Stockpile topsoil to depth not exceeding eight feet (8 Ft). Cover to protect from erosion.

3.2 TOPSOIL EXCAVATION

A. Conform to excavation and stockpiling requirements of Section 02135 Excavation for Roadway.

3.3 PLACEMENT

A. Place no topsoil until subgrade has been approved. For areas to be seeded or sodded, scarify or plow existing material to a minimum depth of four inches (4 In) or as indicated on the Drawings. Remove vegetation and foreign inorganic material. Place four inches (4 In) of topsoil on loosened material and roll lightly with appropriate lawn roller to consolidate topsoil.

B. Increase depth of topsoil to six inches (6 In) when placed over sand bedding and backfill materials specified in Section 02140 Utility

Backfill Materials.

C. For areas to receive shrubs or trees, excavate existing material and place topsoil to depth and dimensions shown on the Drawings.

D. Remove spilled topsoil from curbs, gutters and, paved areas and dispose of excess topsoil in accordance with requirements of Section 01580 Waste Material Disposal.

E. Place topsoil to promote good drainage and compact with light roller. Water topsoil after placement until saturated for a minimum depth six inches (6 In), fill in and recompact areas of settlement.

3.4 PROTECTION

A. Protect topsoil from wind and water erosion until planting is completed.

PART IV: TABLES

4.1 TOPSOIL CHARACTERISTICS

TOPSOIL CHARSCTERISTICS	
CHARSCTERISTIC	**VALUE**
pH Value	Between 5.5 and 6.5
Liquid Limit	50 or Less
Plasticity Index	20 or Less
Gradation	Maximum of 10% passing No. 200 Sieve

END OF SECTION

SECTION 02910

HYDROMULCH SEEDING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Seeding, fertilizing, mulching and maintenance of areas indicated on the Drawings.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Hydromulch seeding is on an acre basis.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certification from supplier that each type of seed conforms to these Specifications and requirements of Texas Seed Law. Certification shall accompany seed delivery.

C. Submit certificate stating that fertilizer complies with these Specifications and requirements of Texas Fertilizer Law.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01580 Waste Material Disposal.

4. Section 02905 □ Topsoil.

5. Section 02915 □ Sodding.

B. Texas Seed Law.

C. USDA □ United States Department of Agriculture rules and regulations of Federal Seed Act.

PART II: PRODUCTS

2.1 MATERIALS

A. Topsoil: Conform to material requirements of Section 02905 □ Topsoil.

B. Seed: Conform to U.S. Department of Agriculture rules and regulations of Federal Seed Act and Texas Seed Law. Seed shall be certified ninety percent (90%) pure and furnish ninety percent (90%) germination and meet following requirements:

1. Rye: Fresh, clean, Italian rye grass seed (lollium multi-florum), mixed in labeled proportions. As tested, the minimum percentages of impurities and germination must be labeled. Deliver in original unopened containers.

2. Bermuda: Extra-fancy, treated, lawn type common Bermuda (Cynodon dactylon). Deliver in original, unopened container showing weight, analysis, name of vendor and germination test results.

3. Wet, moldy or otherwise damaged seed shall not be accepted.

4. Seed requirements, application rates and planting dates are as specified in TABLE 4.1 □ SEEDING CONDITIONS in this Section.

C. Fertilizer: Dry and free flowing, inorganic, water soluble commercial fertilizer, which is uniform in composition. Deliver in unopened containers which bear manufacturers guaranteed analysis. Caked, damaged or otherwise unsuitable fertilizer shall not be accepted. Fertilizer shall contain the minimum percentages of elements as specified in TABLE 4.2 □ MINIMAL FERTILIZER ELEMENTS in this Section.

D. Mulch:

1. Virgin wood cellulose fibers from whole wood chips having a minimum of twenty percent (20%) fibers forty-two hundredths inches (0.42 In) in length and one hundredth inch (0.01 In) in diameter.

2. Cellulose fibers manufactured from recycled newspaper and meeting same fiber content and size as for cellulose fibers from wood chips.

3. Dye mulch green for coverage verification purposes.

E. Soil Stabilizer: "Terra Tack 1" or approved equal.

F. Weed control agent: Pre-emergent herbicide for grass areas, such as "Benefin," or approved equal.

PART III: EXECUTION

3.1 PREPARATION

A. Place and compact topsoil in accordance with requirements of Section 02905 Topsoil.

B. Dispose of Objectionable and Waste Materials in accordance with Section 01580 Waste Material Disposal.

3.2 APPLICATION

A. Seed: Apply uniformly at rates given in TABLE 4.1 SEEDING CONDITIONS in this Section, for type of seed and planting date.

B. Fertilizer: Apply uniformly at rate of five hundred pounds (500 Lbs) per acre.

C. Mulch: Apply uniformly at rate of fifty pounds (50 Lbs) per one thousand square feet (1000 Sf).

D. Soil Stabilizer: Apply uniformly at rate of forty pounds (40 Lbs) per acre.

E. Weed Control Agent: Apply at manufacturer's recommended rate prior to hydro mulching.

F. Sod: Lay single row of sod along perimeter where top soil and

pavement intersect. Apply in conformance to Section 02915 Sodding.

G. Suspend operations under conditions of drought, excessive moisture, high winds or extreme or prolonged cold. Obtain the Project Manager's approval before resuming operations.

3.3 MAINTENANCE

A. Maintain grassed areas for a minimum of ninety days (90 D) or as required to establish an acceptable lawn. For areas seeded in fall, continue maintenance following spring until acceptable lawn is established.

B. Maintain grassed areas by watering, fertilizing, weeding and trimming.

C. Repair areas damaged by erosion by re-grading, rolling and replanting.

D. Reseed small, sparse grass areas. When sparse areas exceed ten percent (10%) of planted area, reseed by hydro mulch.

E. Mow grass when height reaches three and one-half inches (3-1/2 In) or greater on average before final acceptance. Mow to height of two and one-half inches (2-1/2 In).

PART IV: TABLES

4.1 SEEDING CONDITIONS

GRASS SEEDING CONDITIONS		
TYPE	APPLICATION RATE lbs/ac	PLANTING DATE
Hulled Common Bermuda 88/98	40	Jan 1 to Mar 31
Unhulled Common Bermuda 88/98	40	
Hulled Common Bermuda 88/98	40	Apr 1 to Sep 30
Hulled Common Bermuda 88/98	40	Oct 1 to Dec 31
Unhulled Common Bermuda 88/98	40	
Annual Rye Grass (Gulf)	30	

4.2 MINIMAL FERTILIZER ELEMENTS

MINIMAL FERTERLIZER ELEMENT PERCENTAGES	
ELEMENT	PERCENTAGE
Nitrogen	10%
Phosphoric Acid	20%
Potash	10%

END OF SECTION

SECTION 02915

SODDING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Restoration of existing lawn areas disturbed by construction shall be by installation of new sod.

B. Planting of sod within areas designated on the Drawings for purpose of surface stabilization, channel stabilization or vegetation buffer strips.

C. Sod is defined as blocks, squares, strips of turfgrass and adhering soil used for vegetative planting. To be placed edge to edge for complete coverage.

D. Lawn is defined as ground covered with fine textured grass kept neatly mowed.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for sodding is on a square yard basis.

2. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

1.4 REFERENCES

A. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01580 Waste Material Disposal.

4. Section 02905 Topsoil.

B. Structural Pest Control Board of the State of Texas.

1.5 QUALITY ASSURANCE

A. Sod only when weather and soil conditions are deemed by the Project Manager to be suitable for proper placement.

B. Water and fertilize new sod.

C. Guarantee sod to be growing thirty days (30 D) after substantial completion.

D. Maintenance Period:

1. Begin maintenance immediately after each section of grass sod is installed and continue for thirty day (30 D) period from date of substantial completion.

2. Re-sod unacceptable areas.

3. Water, fertilize, control disease and insect pests, mow, edge, replace unacceptable materials and perform other procedures consistent with good horticultural practice to ensure normal, vigorous and healthy growth. Install disease control within guidelines set forth by Structural Pest Control Board of the State of Texas.

E. Notify the Project Manager ten days (10 D) before end of maintenance period for inspection.

PART II: PRODUCTS

2.1 SOD

A. Species: Bermuda (Cynodon Dactylon), Buffalo (Buchloe Dactyloides) or St. Augustine (Stenotaphrum Secundatum) Gulf Coast variety to match existing sod.

B. Contents: ninety-five percent (95%) permanent grass suitable to

climate in which it is to be placed; not more than five percent (5%) weeds and undesirable grasses; good texture, free from obnoxious grasses, roots, stones and foreign materials.

C. Size: twelve inch (12 In) wide strips, uniformly two inches (2 In) thick with clean-cut edges.

D. Sod is to be supplied and maintained in healthy condition as evidenced by grass being normal green color.

2.2 FERTILIZER

A. Available nutrient percentage by weight: twelve percent (12%) nitrogen, four percent (4%) phosphoric acid and eight percent (8%) potash; or fifteen percent (15%) nitrogen, five percent (5%) phosphoric acid and ten percent (10%) potash.

2.3 WEED AND INSECT TREATMENT

A. Provide acceptable treatment to protect sod from weed and insect infestation. Submit treatment method to the Project Manager for approval. Install insect and disease control within guidelines set forth by Structural Pest Control Board of the State of Texas.

2.4 WATER

A. Potable, available on-site through the Contractor's water trucks. The Contractor may use the City of Friendswood hydrants when water use is measured and verified. Do not use private resident's water.

2.5 BANK SAND

A. Free of clay lumps, roots, grass, salt or other foreign material.

PART III: EXECUTION

3.1 PREPARATION

A. Verify that soil placement and compaction have been satisfactorily completed. Verify that soil is within allowable range of moisture content.

B. Top soil shall be free of weeds and foreign material immediately before sodding.

C. Do not start the Work until conditions are satisfactory. Do not start the

Work during inclement or impending inclement weather.

D. Rake areas to be sodded smooth, free from unsightly variations, bumps, ridges or depressions.

E. Two inches (2 In) of top soil shall be placed for sodding preparation in conformance of Section 02905 Topsoil over areas to be sodded prior to planting of sod.

F. Apply fertilizer at rate of twenty-five pounds (25 Lbs) per 1000 square feet. Apply after raking soil surface and not more than forty-eight hours (48 Hrs) prior to laying sod. Mix thoroughly into upper two inches (2 In) of soil. Lightly water to aid in dissipation of fertilizer.

3.2 APPLICATION

A. Full Sodding: Lay sod with closely fitted joints leaving no voids and with ends of sod strips staggered. Lay sod within twenty-four hours (24 Hrs) of harvesting.

B. On slopes two to one (2:1) and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of two feet (2 Ft) on center. Drive pegs flush with soil portion of sod.

C. Prior to placing sod, on slopes three to one (3:1) or where indicated, place Hold/Gro or Roll Lite or equal over topsoil. Securely anchor in place with posts sunk firmly into ground at a maximum of sixteen feet (16 Ft) on center along pitch of slope and equal to width of wire mesh horizontally across slopes.

D. After sod is laid, irrigate thoroughly to secure six inch (6 In) minimum penetration into soil below sod.

E. Tamp and roll sod with approved equipment to eliminate minor irregularities and to form close contact with soil bed immediately after planting and watering. Submit type of tamping and rolling equipment to be used to the Project Manager for approval, prior to construction.

3.3 MAINTENANCE

A. Watering:

1. Water lawn areas once a day with a minimum of one-half inch (1/2 In) of water for first three weeks (3 Wk) after area is sodded.

2. After three week (3 Wk) period, water twice a week with three-quarters inch (3/4 In) of water each time unless comparable amount has been provided by rain.

3. Make weekly inspections to determine moisture content of soil unless soil is in frozen condition.

4. Water in afternoon or at night to enable soil to absorb a maximum amount of water with a minimum evaporation.

B. Mowing:

1. Mow sod at intervals which shall keep grass height from exceeding three and one-half inches (3-1/2 In).

2. Set mower blades at two and one-half inches (2-1/2 In).

3. Do not remove more than one-half (1/2) of grass leaf surface.

4. Mow sodded areas requiring mowing within one month (1 Mo) after installation with light-weight rotary type mower. Mow sod only when dry and not in saturated or soft condition.

5. Remove grass clippings during or immediately after mowing.

C. Fertilizer and Pest Control:

1. Evenly spread fertilizer composite at rate of forty pounds (40 Lbs) per five thousand square feet (5000 Sf) or as recommended by manufacturer. Do not place fertilizer until two weeks (2 Wks) after placement of sod.

2. Restore bare or thin areas by topdressing with mix of fifty percent (50%) sharp sand and fifty percent (50%) sphagnum peat moss.

3. Apply mixture one-quarter inch (1/4 In) to one-half inch (1/2 In) thick.

4. Treat areas of heavy weed and insect infestation as recommended by treatment manufacturer.

D. Restrict all traffic from sodded areas until sod is established or for a minimum of ten days (10 D) during growing season. Use wood lath and plastic tape to cordon sodded areas. Maintain tape and lath throughout for a minimum of thirty days (30 D) during growing season.

3.4 CLEANUP

A. During course of planting, remove excess and waste materials; keep lawn areas clean and take precautions to avoid damage to existing structures, plants, grass and streets.

B. Remove barriers, signs and other the Contractor material and equipment from project site at termination of establishment period.

C. Dispose of unused materials and rubbish in accordance with Section 01580 Waste Material Disposal.

END OF SECTION

SECTION 02920

TREE PLANTING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Tree planting and maintenance.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for tree planting is on unit price basis for each tree planted.

2. When shown on the Drawings or directed by the Project Manager to remove and relocate tree affected by trench zone, work shall be paid for under one (1) of the following bid items:

   a. Bid item "Remove and Relocate Tree" includes moving tree with truck mounted tree spade and replanting same tree in new location. Payment is for each tree removed and relocated.

   b. Bid item "Remove, Temporary Store and Replant Tree" includes moving tree with truck mounted tree spade and replanting tree at temporary location, (determined by the Contractor) maintaining tree until construction is complete and replanting same tree back to its original location. Payment is for each tree removed, stored and replanted.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ANSI American National Standards Institute.

1. ANSI Z 60.1 Nursery Stock.

B. AOAC - Association of Official Agriculture Chemists.

C. CFDCM City of Friendswood Design Criteria Manual.

1. Appendix D Qualified Tree List.

D. CFO City of Friendswood Ordinance.

1. Appendix C Zoning.

E. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01580 Waste Material Disposal.

4. Section 02905 Topsoil.

5. Section 02910 Hydromulch Seeding.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit certification from supplier that each type of tree conforms to these specification requirements.

C. For unpackaged materials, submit analysis by recognized laboratory made in accordance with methods established by Association of Official Agriculture Chemists, when applicable.

D. Submit name and experience of qualified Arborist to the Project Manager.

E. Submit temporary tree storage location. Location must be outside public right-of-way and within five miles (5 Mi) of project site, unless otherwise approved by the Project Manager.

1.5 QUALITY ASSURANCE

A. Landscaper shall be a firm specializing in landscape and planting the Work.

B. Do not make substitutions of approved trees unless approved in writing by the Project Manager. When specified planting material is not obtainable, submit proof of non-availability together with proposal for use of equivalent material. Substitutions of larger size or better grade than specified shall be allowed, but with no increase in unit price.

1.6 DELIVERY, STORAGE and HANDLING

A. Ship trees with Certificates of Inspection as required by governing authorities. Label each tree and shrub with securely attached waterproof tag bearing legible designation of botanical and common name. Do not remove container grown stock from containers before time of planting.

B. Deliver packaged materials in fully labeled original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at Site.

C. Materials shall not be pruned prior to installation unless approved by the Project Manager in writing. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Use protective covering during delivery.

1.7 WARRANTY

A. Warrant trees against defects including death, unsatisfactory growth or loss of shape due to improper pruning, maintenance or weather conditions, for one year (1 Yr) after completion of planting. Plumb leaning trees during warranty period.

B. Remove and replace trees found to be dead during warranty period. Remove and replace trees which are in doubtful condition at end of warranty period or when approved by the Project Manager, extend warranty period for trees for full growing season.

PART II: PRODUCTS

2.1 TREES

A. Provide container grown trees which are straight and symmetrical

and have persistently preferred main leader. Crown shall be in good overall proportion to entire height of tree with branching configuration as recommended by ANSI Z60.1 for type and species specified. Where clump is specified, furnish plant having a minimum of three (3) stems originating from common base at ground line. Measure trees by average caliper of trunk as follows:

1. For trunks up to four inches (4 In) or less in diameter, measure caliper six inches (6 In) above top of root ball.

2. For trunks more than four inches (4 In), measure caliper twelve inches (12 In) above top of root ball.

3. Caliper measurements shall be by diameter tape measure. Indicated calipers on the Drawings are minimum. Averaging of plant calibers shall not be allowed.

B. Trees shall conform to following requirements:

1. Healthy, vigorous stock, grown in recognized nursery.

2. Free of disease, insects, eggs, larvae; and free of defects such as knots, sun-scald, injuries, abrasions, disfigurement or borers and infestations.

2.2 SOIL PRODUCTS

A. Topsoil: Conform to requirements of Section 02905 Topsoil.

B. Peat moss, bark and fertilizer: Use material recommended by nursery for establishment of healthy stock after replanting.

2.3 STAKES AND GUYS

A. Provide a minimum eight foot (8 Ft) long steel T-stakes and one inch (1 In) wide plastic tree chains.

B. Where applicable for anchoring trees, use wood deadmen of at least two inch by four inch (2 In x 4 In) stock, thirty-six inches (36 In) long and buried three feet (3 Ft). Provide white surveyor's plastic tape for flagging tree guys.

2.4 TREE WRAP, TWINE and SEAL

A. Wrap: First (1st) quality, bituminous impregnated tape, corrugated or crepe paper, specifically manufactured for tree wrapping and having

qualities to resist insect infestation.

B. Twine: Lightly tarred, medium-coarse sisal (lath) yarn. Do not use nails or staples to fasten wrapping.

C. Seal: Commercially available asphaltic-base black emulsion specifically produced for use in sealing tree cuts and wounds.

2.5 WATER

A. Water shall be potable from municipal water supplies.

2.6 SOURCE QUALITY CONTROL

A. Notify the Project Manager, prior to installation, of location where trees that have been selected for planting may be inspected. Plant material shall be inspected for compliance with following requirements.

1. Genus, species, variety, size and quality.

2. Size and condition of balls and root systems, insects, injuries and latent defects.

PART III: EXECUTION

3.1 PREPARATION

A. Schedule the Work so that planting can proceed rapidly as portions of site become available. Plant trees after final grades are established and prior to planting of lawns, unless otherwise approved by the Project Manager in writing. When planting of trees occurs after seeding the Work, protect lawn areas and promptly repair damage to lawns resulting from tree planting operations.

B. Layout individual trees at locations shown on the Drawings. In case of conflicts, notify the Project Manager before proceeding with the Work. Trees shall be staked and approved by the Project Manager prior to planting.

C. Trees shall not be planted in the City Rights-of-Way.

3.2 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, sod, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.

B. Strip and utilize four inch (4 In) layer of top soil, placed on esplanades under Section 02910 Hydromulch Seeding, for planting soil mixture.

C. Mix recommended soil amendments with topsoil at following rates:

1. Top soil: Fifty percent (50%).

2. Peat moss: Twenty-five percent (25%).

3. Well rotted Bark: Twenty-five percent (25%).

4. Fertilizer: Rate recommended by nursery.

D. Delay mixing of fertilizer when planting shall not follow placing of planting soil within forty-eight hours (48 Hr), unless otherwise directed.

E. Incorporate amendments into soil as part of soil preparation process prior to fine grading, fertilizing and planting. Broadcast or spread amendments evenly at specified rate over planting area. Thoroughly incorporate amendments into top two inches (2 In) or three inches (3 In) of soil until amendments are pulverized and have become homogeneous layer of topsoil ready for planting.

3.3 PLANTING

A. Excavate pits, beds or trenches with vertical sides and with bottom of excavation raised a minimum of six inches (6 In) at center for proper drainage. Provide following minimum widths:

1. Fifteen gallon (15 Gal) containers or larger, two feet (2 Ft) wider than diameter of root ball.

2. One gallon (1 Gal) and five gallon (5 Gal) containers, six inches (6 In) wider than diameter of root ball.

B. When conditions detrimental to plant growth are encountered, such as unsatisfactory soil, obstructions or adverse drainage conditions, notify the Project Manager before planting.

C. Deliver trees after preparations for planting have been completed and plant immediately. When planting is delayed more than six hours (6 Hr) after delivery, set trees and shrubs in shade, protect from weather and mechanical damage and keep roots moist by

covering with mulch, burlap or other acceptable means of retaining moisture and water as needed.

D. Set root ball on undisturbed soil in center of pit or trench and plumb plant. Place plants at level that, after settlement, natural relationship of plant crown with ground surface shall be established.

E. When set, place additional backfill around base and sides of ball and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately two-thirds (2/3) full, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

F. Dish top of backfill to allow for mulching. Mulch pits, trenches and planted areas. Provide not less than four inch (4 In) thickness of mulch, work into top of backfill and finish level with adjacent finish grades. Cover entire root ball.

G. Prune, thin out and shape trees in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed in writing, do not cut tree leaders and remove only injured and dead branches from flowering trees. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

H. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures.

I. Guy and stake trees immediately after planting.

J. Control dust caused by planting operations. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

3.4 FIELD QUALITY CONTROL

A. The Project Manager may reject unsatisfactory or defective material at anytime during progress of the Work. Remove rejected trees immediately from site and replace with specified materials. Plant material not installed in accordance with these Technical Specifications shall be rejected.

B. An inspection to determine final acceptance shall be conducted by the Project Manager at end of twelve month (12 Mo) maintenance period. Additional inspections shall be conducted for extended warranty periods provided for in paragraph 1.7.B.

3.5 MOVING EXISTING TREES

A. Perform tree moving and replanting by a professional Arborist during dormant growth season.

B. Provide tree spade of adequate size as directed by professional Arborist.

3.6 MAINTENANCE

A. Maintain trees during planting operations and for period of twelve months (12 Mos) after completion of planting.

B. Water trees to full depth a minimum of once each week or as required to maintain healthy vigorous growth.

C. Prune, cultivate and weed as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

3.7 CLEANUP AND PROTECTION

A. During planting work, keep pavements clean and work area in orderly condition.

B. Protect planting work and materials from damage due to planting operations. Maintain protection during installation and maintenance period. Treat, repair or replace damaged planting work as directed by the Project Manager.

C. Dispose of excess soil and waste in accordance with requirements of Section Waste 01580 Waste Material Disposal. On-site burning of combustible cleared materials shall not be permitted.

END OF SECTION

SECTION 02925

LANDSCAPE IRRIGATION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Pipe and fittings, valves, sprinkler heads and accessories.

B. Control system.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for landscape irrigation shall be made under this Section on lump sum basis.

2. Payment for capped irrigation sleeve, for connection to future system expansion, is on linear foot basis.

3. Refer to Section 01270 □ Measurement and Payment.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM □ American Society for Testing and Materials.

1. ASTM D2564 □ Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

2. ASTM D2241 □ Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure □ Rated Pipe (SDR Series).

B. CFTS □ City of Friendswood Technical Specifications.

1. Section 00300 □ Unit Price Form.

2. Section 01270 □ Measurement and Payment.

3. Section 01315 Coordination and Meetings.

4. Section 01330 Submittal Procedures.

5. Section 01755 Starting Systems.

1.4 SYSTEM DESCRIPTION

A. Electric solenoid controlled underground irrigation system.

B. Source Power: one hundred volt (120 V).

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in performing work of this Section with a minimum three years (3 Yr) documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for piping and component requirements.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene one week (1 Wk) prior to commencing work of this Section.

1.9 COORDINATION

A. Coordinate work with site landscape grading and delivery of plant life.

1.10 EXTRA MATERIALS

A. Furnish extra components under provisions of Section 00300 Unit Price Form.

1. Two (2) sprinkler heads of each type and size.

2. Two (2) valve box keys.

3. Two (2) wrenches for each type head core and for removing and installing each type head.

PART II: PRODUCTS

2.1 PIPE MATERIALS

A. Pipe shall be continuously and permanently imprinted with manufacturer's name, size, schedules, type and working pressure.

B. PVC Pipe ASTM D2241; Two hundred pound per square inch (200 psi) pressure rated upstream from controls, one hundred sixty pounds per square inch (160 psi) downstream; solvent welded sockets rubber gasket joints.

C. Fittings: Type and style of connection to match pipe.

D. Solvent Cement: ANSI/ASTM D2564 for PVC pipe and fittings.

E. Sleeve material: Four inch (4 In) schedule 40 PVC.

2.2 OUTLETS

A. Manufacturer's or approved equal:

1. Rainbird Model 1804.
2. Rainbird Model 1812.
3. Hunter Model PGP.

B. Rotary type sprinkler head: Pop-up type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.

C. Spray Type Sprinkler Head: Pop-up head with full circle, half circle, third circle, quarter circle and square pattern.

2.3 VALVES

A. Manufacturer's or approved equal:

1. Rainbird Model PEB Series.

B. Gate Valves: Bronze construction, non-rising stem and sized to line.

C. Backflow Preventers: FEBCO 765 Bronze body construction, reduced pressure zone or pressure vacuum breaker type.

D. Valve Box and Cover: rectangular ten inches by four inches (10 In x 4 In) or nine inches (9 In) round.

2.4 CONTROLLER

A. Manufacturer's or approved equal:

1. Rainbird Model RC1260C.

B. Valves: Electric solenoid wiring including required fittings and accessories.

C. Wire conductors: Color coded.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01315 Coordination and Meetings.

B. Verify location of existing utilities.

C. Verify that required utilities are available, in proper location and ready for use.

3.2 PREPARATION

A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover and structures.

B. Layout and stake locations of system components.

C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.3 TRENCHING

A. Trench and filling as required.

B. Trench size:

1. Minimum cover over installed supply piping: Eighteen inches (18 In).

2. Minimum cover over installed branch piping: Twelve inches (12

In).

3. Minimum cover over installed outlet piping: Twelve inches (12 In).

C. Trench to accommodate grade changes.

D. Maintain trenches free of debris, material or obstructions that may damage pipe.

E. Do not leave trenches open overnight.

3.4 INSTALLATION

A. Install pipe, valves, controls and outlets in accordance with manufacturer's instructions.

B. Connect to utilities.

C. Set outlets and box covers at finish grade elevations.

D. Install control wiring as required. Provide ten inch (10 in) expansion coil at each valve to which controls are connected and at one hundred foot (100 Ft) intervals. Bury wire beside pipe. Mark valves with neoprene valve markers containing locking device. Set valve markers in one hundred pounds per square inch (160 psi) PVC pipe risers exiting from top of valve to finish grade.

E. After piping is installed, but before outlets are installed and filling commences, open valves and flush system with full head of water.

F. Coordinate pipe installation with conduit installation.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed.

B. Prior to filling, test system for leakage for whole system to maintain one hundred pounds per square inch (100 psi) pressure for one hour (1 Hr).

3.6 FILLING

A. Cover with three inches (3 In) of sand over piping; fill trench and compact to subgrade elevation. Protect piping from displacement.

3.7 ADJUSTING

A. Adjust control system to achieve time cycles required.

B. Change and adjust head types for full water coverage as directed.

3.8 DEMONSTRATION

A. Demonstrate system under provisions of Section 01755 Starting Systems.

B. Instruct City's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

END OF SECTION

SECTION 02930

CEDAR FENCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Furnishing and installation of cedar picket fencing, galvanized steel posts, and gates plus all accessories incidentals and specials necessary for the proper erection and installation of the fence and gates.

B. The Contractor shall construct cedar picket fencing including posts, and gates as shown on the Drawings and in accordance with this Specification.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Cedar Fence shall be on a per linear foot basis to include all necessary hardware, concrete, materials and labor.

2. No separate payment shall be made for each gate. Gates shall be paid under Cedar Fence as part of the linear footage.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. CTFS City of Friendswood Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 03300 Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Submit proposed design mix and test data for each type and strength of concrete.

C. Submit manufacturer s data and details of following items for approval:

1. Cedar Fence Pickets.

2. Galvanized Posts.

3. Timber Rails.

4. Materials to be used for installation.

5. Latch and hinge hardware.

6. Installation instructions for forms.

PART II: PRODUCTS

2.1 STYLE OF FENCE

A. The fence shall be eight feet (8 Ft) in overall height consisting of blunt cedar pickets attached to three (3) horizontal wooden rails on galvanized steel posts.

2.2 TERMINAL POSTS

A. End, corner and intermediate brace posts shall be hot dipped galvanized three inch (3 In) O.D. schedule 40 steel pipe set in concrete in a twelve inch (12 In) hole not less than thirty-nine inches (39 In) deep.

B. Intermediate posts shall be evenly spaced on centers between end and/or corner posts with a maximum spacing of seventy-five feet (75 Ft).

2.3 LINE POSTS

A. Line posts shall be hot dipped galvanized two and three-eighths inch (2-3/8 In) O.D. diameter schedule 40 steel pipe evenly spaced on centers not to exceed ten feet (10 Ft).

B. Posts shall be set in concrete in a twelve (12) inch diameter hole not less than thirty-three inches (33 In) deep.

2.4 GATE POSTS

A. Gate posts shall be hot dipped galvanized, schedule 40 steel pipe, set in concrete in a hole of a minimum diameter of twelve inches (12 In) or three (3) times the post diameter, and not less than fifty-one inches (51 In) deep.

B. Post sizes and rails shall be as specified in TABLE 4.1 GATE MATERIALS in this Section.

2.5 RAILS

A. Rail material shall be two inch by four inch (2 In x 4 In) commercially available pine lumber, Number 1 grade, straight, free of knots and other defects, pressure treated, exterior grade, a minimum of twelve feet (12 Ft) in length.

B. Rail splices shall be made utilizing hot dipped galvanized rail splices, commercially available and shall overlap splices on adjacent rails a minimum of two feet (2 Ft).

C. Bottom rail shall be located at a sufficient distance above finished grade to allow attachment of a one inch by eight inch (1 In x 8 In) cedar rot board between the ground and the bottom of the fence pickets.

D. Bent or warped rails which would create an uneven mounting surface for the fence pickets shall not be accepted.

E. The middle and top rails shall be spaced evenly between the bottom rail and within six inches (6 In) below the top of the posts.

F. Rails shall be attached to line posts with five-sixteenths inch by four and three-quarter inch (5/16 In x 4-3/4) hot dipped galvanized carriage bolts with flat washers and nuts, two (2) per rail on each post.

G. Rails shall be attached to terminal posts with five-sixteenths inch by five and one-half inch (5/16 In x 5-1/2 In) hot dipped galvanized carriage

bolts with flat washers and nuts, two (2) per rail on each post.

H. Rails shall be attached to gate posts with hot dipped galvanized carriage bolts with flat washers and nuts, two (2) per rail on each post.

I. Rails shall be attached to gate posts with hot dipped galvanized carriage bolts with flat washers and nuts of the size shown in paragraph 2.4.B. of this Section.

J. Each rail member shall be supported by a minimum of two (2) posts between splices.

K. Splices shall not be made within four inches (4 In) of posts.

2.6 CEDAR PICKETS AND ROT BOARDS

A. Fencing pickets shall be one inch by six inch by eight feet long (1 In x 6 In x 8 Ft) commercially available cedar pickets number 1 graded, straight, free of knots and other defects and pointed on top.

B. Rot boards shall be one inch by eight inch by ten feet long (1 In x 8 In x 10 Ft) cedar number 1 graded, straight, free of knots and other defects.

C. Pickets and rot boards shall be of uniform coloration, size and grading to provide a neat and consistent appearance of the finished fence.

D. Bent or warped pickets or rot boards which would cause openings between adjacent pickets greater than one-quarter inch (1/4 In) in width shall not be accepted.

E. Pickets and rot boards shall be attached to rails with hot dipped galvanized 2-p nails, two (2) per rail on each picket.

F. Pickets shall be mounted against the rot board to provide approximately two inches (2 In) of clearance above finished grade.

2.7 GATES

A. Gate frames shall be fabricated of hot dipped galvanized two inch (2 In) O.D. schedule 40 steel pipe with galvanized pressed steel or malleable iron corner ells, securely riveted to the frame with four (4) rivets per corner.

B. Internal bracing shall be hot dipped galvanized one and one-quarter inch (1-1/4 In) schedule 40 steel pipe with three-eighths inch (3/8 In) adjustable truss rods.

C. Gates may be of the swing or slide type as approved or as shown on the Drawings.

D. Gates shall be provided with padlocking device.

E. Swing gates over six feet (6 Ft) in width shall have rollers near ends to make them easier to open and close.

F. Gates six feet (6 Ft) and greater in width shall have center rests and semiautomatic catch to secure gate in open position.

G. The bottom hinge shall be:

1. A ball and socket type; or

2. A type allowing pivot on vertical member of gate frame.

3. Gate removal shall not require disassembly of the hinge.

4. Made of malleable iron.

H. The upper hinge shall be:

1. A one hundred degree (180°) wrap-around type,

2. made of malleable iron, base galvanized; and

3. allow gate to swing one hundred eighty degree (180°) in either direction.

I. Slide gates shall be track mounted or wheeled in such a manner as to provide a maximum opening clearances of gate.

J. Attach fencing pickets to gate frame with five-sixteenths inch by three and one-quarter inch (5/16 In x 3-1/4 In) hot dipped galvanized carriage bolts with flat washers and nuts, a minimum of two (2) per picket.

PART III: EXECUTION

3.1 INSTALLATION

A. The fence shall be installed by skilled and experienced fence erectors, and on lines and grades indicated on the Drawings.

3.2 CONSTRUCTION

A. All posts shall be capped and set plumb and in three thousand (3000 psi) compressive strength concrete footings of the size specified under corresponding post section of this specification and conforming to Section 03300 □Structural Concrete.

B. The concrete shall extend a minimum three inches (3 In) below the bottom of the post.

C. Concrete shall be crowned slightly above grade to provide drainage and troweled to provide a smooth, neat appearance.

D. Galvanizing shall be in accordance with ASTM A123.

E. No aluminum or pot metal fittings shall be acceptable.

PART IV: TABLES

TABLE 4.1 GATE MATERIALS

MAXIMUM WIDTH OF SINGLE GATE (FT)	DIAMETER OF POST (IN)	RAIL ATTACHEMENT BOLT SIZE
6	3	5/16□x 5 1/2"
12	4	5/16□x 6 1/2"
16	6	3/8□x 8 1/2"
20	8	3/8□x 10 1/2"

END OF SECTION

SECTION 02935

CHAIN LINK FENCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Furnishing and installation of chain link fencing, galvanized steel posts, and gates plus all accessories incidentals and specials necessary for the proper erection and installation of the fence and gates.

B. The Contractor shall construct chain link fencing including posts, and gates as shown on the Drawings and in accordance with this Specification.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Payment for Chain Link Fence shall be on a per linear foot basis to include all necessary hardware, concrete, materials and labor.

2. No separate payment shall be made for each gate. Gates shall be paid under Chain Link Fence as part of the linear footage.

3. Refer to Section 01270 Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Materials.

1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM A90 Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

3. ASTM A121 – Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.

4. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

6. ASTM A392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

B. CTFS – City of Friendswood Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01580 – Waste Material Disposal.

4. Section 03300 – Structural Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit proposed design mix and test data for each type and strength of concrete.

C. Submit manufacturer's data and details of following items for approval:

1. Chain Link Fabric Mesh.

2. Galvanized Posts.

3. Materials to be used for installation.

4. Latch and hinge hardware.

5. Installation instructions for forms.

PART II: PRODUCTS

2.1 FABRIC

A. Wire Fabric for fencing shall be nine gauge (9 Ga) steel with a minimum tensile strength of eighty thousand pounds per square inch (80,000 psi). Mesh size shall be two inches (2 In) between parallel wires. Top salvages knuckled for sixty inch (60 In) or less in height. Top and bottom salvages twisted and barbed for fabric over sixty inches (60 In) in height. Fabric shall be furnished in one-piece.

B. Barbed Wire for mounting on security arms to be twelve and one-half gauge (12 1/2 Ga) with four-point (4 pt) barbs spaced at five inches (5 In) apart. Three (3) strands of barbed wire shall be required.

C. Fabric Ties shall be eleven gauge (11 Ga) steel to fasten fabric to top rail at eighteen inch (18 In) intervals. Ties shall be furnished to fasten the fabric to the bottom tension wire at eighteen inch (18 In) intervals. Ties shall be furnished to attach fabric to line posts at fifteen inch (15 In) intervals.

D. Bottom Tension Wire shall be seven gauge (7 Ga) coil wire.

2.2 RAILS AND POSTS

A. Top Rail shall be one and sixty-six hundredths inch (1.66 In) outside diameter (OD) steel pipe weighing two and twenty-seven hundredths pounds per foot (2.27 lb/ft). Top rail shall be furnished in random lengths not less than eighteen feet (18 Ft) per section and shall be joined with outside sleeve, steel couplings not less than six inches (6 In) long and having a wall thickness not less than seven hundredths of an inch (0.7 In) Couplings shall be designed to allow for expansion and movement of the top rail.

B. Posts shall be furnished in sufficient quantity to provide a maximum spacing of ten feet (10 Ft). Minimum size and weights are as specified in TABLE 4.1 LINER POST REQUIREMENTS, TABLE 4.2 CORNER, PULL AND END POST REQUIREMENTS, and TABLE 4.3 GATE POSTS in this Section.

C. Post Brace Assembly shall be manufacturers standard adjustable brace at end and gate posts, at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Brace to be same material as top rail and trussed to line posts with three-eighths inch (3/8 In) diameter rod with adjustable turnbuckles.

D. Post Caps for pipe shall be designed to exclude moisture. Where barbed wire is specified, extension arms shall be integral with post caps. Where top rail is specified, post caps shall have an opening for the top rail. All post caps shall have a two inch (2 In) skirt for rigidity.

E. Tension bars shall be not less than three-sixteenths of an inch (3/16 In) by three-quarters of an inch (3/4 In) flat steel and not more than two inches (2 In) shorter than the fabric height. One (1) tension bar shall be provided for each gate and end post. Two (2) tension bars shall be provided for each corner and pull post. Tension bars shall be attached to terminal posts with one inch (1 In) twelve gauge (12 Ga) flat steel bands, with carriage bolts at intervals not exceeding fifteen inches (15 In).

F. Barbed Wire Support Arms shall be metal and finish to match fence framework, with provision for anchoring to posts and attaching three (3) rows of barbed wire with each arm. Supporting arms may either be attached to posts or integral with post top weather cap and shall be capable of withstanding two hundred fifty pounds (250 Lb) downward pull at outermost end. Arms shall be at a forty-five degree (45°) angle from vertical.

2.3 GATES

A. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members a maximum of eight feet (8 Ft) apart unless otherwise indicated. Provide same fabric as for fence, unless otherwise indicated. Install fabric with tension bars at vertical edges and at top and bottom edges. Attach tension bars to gate frame not more than fifteen inches (15 In) on center (OC).

Install one (1) diagonal cross-bracing consisting of a minimum three-eighths inch (3/8 In) adjustable length truss rods with turn-buckles on gates to ensure frame rigidity without sag or twist.

Where barbed wire is indicated above gates extend end members of gate frames one foot (1 Ft) above top member and prepare to receive three (3) strands of wire. Provide necessary clips for securing wire to extensions.

B. Swing gates shall be fabricated with frames a minimum of one and seven-eights inch (1 7/8 In) outside diameter (OD) pipe weighing two

and seventy-two hundredths pounds per foot (2.72 Lb/Ft). The top of all gate frames shall align with the fencing top rail. Vehicular gates shall be four inches (4 In) greater in overall height than the adjacent fencing so as to extend to within two inches (2 In) of pavement between curb, if curbs are designated are designated on the Drawings.

1. Corner and tee fittings of malleable iron or pressed steel having means of attaching diagonal members. Hinges of malleable iron providing for full one hundred eighty degree (180°) swing with bottom hinges to be ball and socket type.

2. Diagonal braces consisting of a minimum one-half inch (1/2 In) truss rods with turn-buckles, two (2) for each gate frame. Vertical gates shall have vertical one and seven-eighths inch (1 7/8 In) outside diameter (OD) pipe brace at the center of each gate leaf.

C. Provide gate hardware and accessories for each gate galvanized in accordance with ASTM A153 and as specified below:

1. Hinges: Size and material to suit gate size, non-liftoff type, offset to permit one hundred eighty degree (180°) gate opening. Provide three (3) hinges for each leaf over six foot (6 Ft) nominal height.

2. Latch: Forked type or plunger-bar type to permit operation from either side of gate with padlock eye as integral part of latch.

3. Provide keeper for vehicle gates which automatically engages gate leaf and holds it in open position until manually released. Keeper to be anchored at least twelve inches (12 In) into a twelve inch by twenty-four inch (12 In x 24 In) concrete footing.

4. Double gates shall be provided with gate stops consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch permitting both gate leaves to be locked with single padlock.

D. Roller Gates shall be the responsibility of the Contractor to design using same fabric as for fence. Drawings shall indicate the size of opening for single or double gate application. Design to provide for free flowing opening and closing. Additional rollers or support bearing wheel should be incorporated to minimize binding where necessary.

2.4 GALVANIZING

A. All material used in chain link fencing shall be hot-dip zinc coated as specified by the following:

1. All posts and pipe shall be one and eight-tenth ounces per square foot (1.8 Oz/SF) in accordance with ASTM A53.

2. All H-Beam Sections shall be two ounces per square foot (2.0 Oz/SF) in accordance with ASTM A123.

3. Fence Fabric shall be one and two-tenths ounces per square foot (1.2 Oz/SF) in accordance with ASTM A392, Class I.

4. Tension and Barbed wire shall be eight-tenths ounce per square foot (0.8 Oz/SF) in accordance with ASTM A121, Class III.

5. Post Caps, Tension Bars and Miscellaneous fittings shall be in accordance with ASTM A153.

6. The weight of zinc coating for all items shall be determined in accordance with ASTM A90.

PART III: EXECUTION

3.1 INSTALLATION

A. The fence shall be installed by skilled and experienced fence erectors, and on lines and grades indicated on the Drawings.

3.2 CONSTRUCTION

A. The Contractor shall perform all clearing of brush and debris, which may be necessary for the installation of the fencing.

B. The fencing panels between corner and terminal posts shall generally follow the finished ground elevations. The Contractor shall grade off minor irregularities in the path of the fencing as necessary to limit the variation of grade under bottom edge of fence fabric to a distance of not more than six inches (6 In) and not less than two inches (2 In) from the ground at any point along the fencing.

C. Post Spacing:

1. Line Posts shall have a maximum spacing of no more than ten feet (10 Ft).

2. Pull Posts shall not be located more than five hundred feet (500 Ft) and shall be installed at each change in direction exceeding twenty degrees (20°), both vertically and horizontally.

3. Runs of fencing over five hundred feet (500 Ft) but less than one thousand feet (1,000 Ft) shall have a pull post in the center of the run.

D. Holes

1. Holes for concrete footings for all posts shall be drilled to the dimension as specified in TABLE 4.4 □ HOLES FOR LINE, TABLE 4.5 □ HOLES FOR END POSTS, and TABLE 4.6 □ HOLES FOR GATE POSTS.

2. Concrete footings shall be Class A Concrete, NO EXCEPTIONS. Concrete shall be in accordance with Section 03300 □ Structural Concrete. All concrete footings shall be cast up to finished grade and crowned one inch (1 In) to shed water. Excess concrete and other material shall be removed and disposed of in accordance with Section 01580 □ Waste Material Disposal.

E. The fence fabric shall be erected by securing one (1) end and applying sufficient tension to the other to remove all slack before making attachments. The fabric shall be cut and each span shall be attached independently at all corner posts and pull posts.

F. Fastening to end, pull, corner and gate posts shall accomplished with tension bars which shall be secured to the post with tension bar bands at intervals not to exceed fifteen inches (15 In).

G. Fence fabric shall generally follow the finished contour of the site with the bottom edge of the fabric located two inches (2 In) above the grade.

H. Erect fencing to generally follow ground surface and adjust irregularities in grade. Where depressions or swales are crossed by the fencing, provide galvanized pipe and ire fabric laced to main fabric to prevent entrance of small animals but permit natural drainage flow.

I. Join top rails with suitable sleeve-type couplings, making rigid

connections with provisions for expansion and contraction. Pass rail through base line post barbed wire extension arm and fasten securely to terminal post.

J. Brace all terminal posts with brace member securely fastened to terminal and first line post. Tie terminal post near ground line to line post at brace member with steel tension rod complete with turn-buckle.

PART IV: TABLES

TABLE 4.1 LINE POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	H-BEAM SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	1.90	2.27	2.70	24
4 to 8	2.375	3.65	4.10	24
8 to 12	2.875	5.79	5.79	24

TABLE 4.2 CORNER POST, PULL POST AND END POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	2.75	3.65	30
4 to 8	2.875	5.79	36
8 to 12	3.50	9.10	36

TABLE 4.3 GATE POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	2.875	5.79	36
4 to 8	4.00	9.11	36
8 to 12	6.625	18.79	42

TABLE 4.4 HOLES FOR LINE POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	9	30	24
4 to 8	9	30	24
8 to 12	9	30	24

TABLE 4.5 HOLES FOR END POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	12	36	30
4 to 8	12	42	36
8 to 12	12	42	36

TABLE 4.6 HOLES FOR GATE POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	12	42	36
4 to 8	18	42	36
8 to 12	18	48	42

END OF SECTION

SECTION 03100

MORTAR

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Mortar and grout for masonry.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for mortar for facilities under this Section. Include payment in Lump Sum for building or structure with price breakdown included in Schedule of Values.

2. No separate payment shall be made for mortar utilities under this Section. Include payment in unit price for the utility work.

3. Refer to Section 01270 Measurement and Payment and Section 01295 Schedule of Values.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM American Society for Testing and Material.

1. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

2. ASTM C143 Standard Testing Method for Slump of Hydraulic Cement Concrete

3. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.

4. ASTM C150 Standard Specification for Portland Cement.

5. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.

6. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

7. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.

8. ASTM C476 – Standard Specification for Grout for Masonry.

9. ASTM C780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

B. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01295 – Schedule of Values.

3. Section 01330 – Submittal Procedures.

4. Section 01450 – Contractor's Quality Control.

5. Section 01470 – Testing Laboratory Services.

6. Section 01475 – Quality Control Testing Procedures.

7. Section 01610 – Approved Products List.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Include design mix, indicate Property Method used, required environmental conditions, and admixture limitations.

C. Samples: Submit two (2) ribbons of each mortar color, illustrating color and color range.

D. Submit test reports under provisions of Section 01450 – Contractor's Quality Control.

E. Submit test reports on mortar indicating conformance to ASTM C270.

F. Submit test reports on grout indicating conformance to ASTM C476.

G. Submit manufacturer's certificate under provisions of Section 01450 – Contractor's Quality Control, that products meet or exceed specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and protect products under provisions of Section 01610 – Approved Products List.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperatures to a minimum fifty degrees Fahrenheit (50° F) prior to, during, and forty-eight hours (48 Hrs) after completion of masonry work.

1.7 MIX TESTS

A. Test mortar and grout in accordance with Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures.

B. Testing of Mortar Mix: Test in accordance with ASTM C780. Test mortar mix for compressive strength, consistency, mortar aggregate ratio, water content, air content, and splitting tensile strength.

C. Testing of Grout Mix: Test in accordance with ASTM C109. Test grout mix for compressive strength and slump.

PART II: PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150, Type I, white color.

B. Masonry Cement: Not permitted.

C. Mortar Aggregate: ASTM C144, standard masonry type. Grading and color suitable for type of masonry, one (1) source for entire project. [Not less than five percent (5%) shall pass No. 100 sieve].

D. Hydrated Lime: ASTM C207, Type S.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

2.2 MORTAR COLOR

A. Mortar Color: Mineral oxide pigment; color; to be selected by the Project Manager from manufacturer's samples.

2.3 ADMIXTURES

A. Antifreeze: Antifreeze admixtures shall not be permitted.

B. Accelerator: Accelerator may be used only with approval of the Project Manager.

2.4 MORTAR

A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type S utilizing Property Method to achieve one thousand eight hundred pounds per square inch (1800 psi) strength.

B. Mortar for Non-load Bearing Walls and Partitions: ASTM C270, Type S utilizing the Property Method to achieve one thousand eight hundred pounds per square inch (1800 psi) strength.

C. Mortar for Masonry Below Grade or in Contact with Earth: ASTM C270, Type M utilizing the Property Method to achieve two thousand five hundred pounds per square inch (2500 psi) strength.

D. Pointing Mortar: ASTM C270, Type N, using the Property Method to achieve seven hundred fifty pounds per square inch (750 psi) strength.

2.5 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270 to achieve strengths noted in Paragraph 2.4.

B. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

C. Do not use anti-freeze compounds to lower freezing point of mortar.

D. If water is lost by evaporation, retemper only within two hours (2 Hrs) of mixing.

E. Use mortar within two hours (2 Hrs) after mixing at temperatures of

eighty degrees Fahrenheit (80° F), or two and one-half hours (2-1/2 Hrs) at temperatures under fifty degrees Fahrenheit (50° F).

2.6 GROUT

A. Bond Beams, Lintels, and Other Areas to be Grouted Solid: Three thousand pounds per square inch (3000 psi) strength at twenty-eight days (28 D); seven inch (7 In) to eight inch (8 In) slump per ASTM C143; mixed in accordance with ASTM C476, Fine Grout.

2.7 GROUT MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C476, Fine Grout.

B. Add admixtures in accordance with manufacturer's instructions. Provide uniformity of mix.

C. Do not use anti-freeze compounds to lower freezing point of grout.

PART III: EXECUTION

3.1 EXAMINATION

A. Request inspection of spaces to be grouted.

3.2 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean out holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

3.3 INSTALLATION

A. Install mortar and grout in accordance with manufacturer's instructions.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove grout spaces of excess mortar.

END OF SECTION

SECTION 03105

GROUT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Mix design requirements, testing, furnishing and production of grout for:

1. Pressure grouting of jacked-pipe.

2. Annular grouting of cased or uncased sewer pipe.

3. Grouting voids in ground resulting from caving, loss of ground or settlement.

B. Compaction grouting is not part of this specification.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No separate payment shall be made for the Work performed under this Section. Include cost of such the Work in contract unit prices for the Work of which it is component part.

2. Refer to Section 01270 - Measurement and Payment for Unit Price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for the Work in this Section is included in Total Stipulated Price.

1.3 DEFINITIONS

A. Pressure Grouting: Filling void behind liner or pipe with grout under pressure sufficient to ensure void is properly filled but without overstressing temporary or permanent ground support or causing ground heave to occur.

B. Annular Grouting: Filling annular space between carrier pipe and casing or ground, by pumping.

C. Ground Stabilization Grouting: Filling of voids, fissures or under-slab settlement due to caving or loss of ground by injecting grout under gravity or pressure to fill void.

1.4 REFERENCE STANDARDS

A. ASTM American Society for Testing and Materials.

1. ASTM C138 Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.

2. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.

3. ASTM C150 Standard Specification for Portland Cement.

4. ASTM C494 Standard Specification for Chemical Admixture for Concrete.

5. ASTM C869 Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.

6. ASTM C937 Standard Specification for Grout Fluidifier for Pre-placed Aggregate Concrete.

7. ASTM C942 Standard Test Method for Compressive Strength of Grout for Pre-placed Aggregate Concrete into Laboratory.

8. ASTM C1017 Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.

B. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

3. Section 01470 Testing Laboratory Services.

4. Section 01475 Quality Control Testing Procedures.

5. Section 03300 Structural Concrete.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit description of materials, grout mix, equipment and operational procedures to accomplish each grouting operation. Description may include sketches as appropriate, indicating type and location of mixing equipment, pumps, injection points, venting method, flow lines, pressure measurement, volume measurement, grouting sequence, schedule and stage volumes. Tests and certifications shall have been performed within last twelve months (12 Mos) prior to date of submittal.

C. Submit grout mix design report, including:

1. Grout type and designation.

2. Grout mix constituents and proportions, including materials by weight and volume.

3. Grout densities and viscosities, including wet density at point of placement.

4. Initial set time of grout.

5. Bleeding, shrinkage/expansion.

6. Compressive strength.

D. For cellular grout, also submit the following:

1. Foam concentrate supplier's certification of dilution ratio for foam concentrate.

2. A description of proposed cellular grout production procedures.

E. Maintain and submit logs of grouting operations indicating pressure, density and volume for each grout placement.

PART II: PRODUCTS

2.1 MATERIALS

A. Grouting materials: Conform to Section 03300 Structural Concrete, except as modified in the following paragraphs.

B. Grout Type Applications.

1. Grout for pressure grouting, backfill grouting and annular grouting: Sand-cement mortar mix.

2. Grout for annular grouting of sanitary sewer: Low density (cellular) grout, unless otherwise approved by the Project Manager.

3. Grout for filling space in manholes: Sand-cement mortar mix.

4. Ground stabilization: Sand-cement mortar mix.

C. Do not include toxic or poisonous substances in grout mix or otherwise inject such substances underground.

2.2 GROUT

A. Develop one (1) or more mixes based on following criteria as applicable:

1. Size of annular void between sewer pipe and casing or size of void between casing and surrounding soil.

2. Absence or presence of groundwater.

3. Adequate retardation.

4. Non-shrink characteristics.

5. Pumping distances.

B. Prepare mixes that satisfy required application. Provide materials conforming to the following standards:

1. Cement: ASTM C150.

2. Water: Potable.

3. Foam: ASTM C869.

4. Slurry: ASTM C138.

5. Cellular Grout: ASTM C138.

6. Sand for sand-cement mortar mix: ASTM C144.

C. Provide grout meeting the following minimum requirements:

1. Minimum twenty-eight day (28 D) unconfined compressive strength: one thousand five hundred pounds per square inch (1500 psi) for water lines, one thousand pounds per square inch (1000 psi) for other carrier pipes for mortar grout and three hundred pounds per square inch (300 psi) for cellular grout.

2. Determine strength by ASTM C942.

3. Maximum allowable density: Less than one hundred thirty pounds per cubic foot (130 pcf).

D. Fluidifier: Provide fluidifier, meeting ASTM C937 that holds solid constituents of grout in colloidal suspension and is compatible with cement and water used in grouting operations.

E. Admixtures.

1. Use admixtures meeting ASTM C494 and ASTM C1017 as required, to improve pump ability, control time of set, hold sand in suspension and reduce segregation and bleeding.

2. For cellular grout, do not use foam or admixtures that promote steel corrosion.

3. Ensure that admixtures used in mix are compatible. Provide written confirmation from admixture manufacturers of their compatibility.

PART III: EXECUTION

3.1 PREPARATION

A. Notify the Project Manager at least twenty-four hours (24 Hrs) in advance of grouting operations.

B. Select and operate grouting equipment to avoid damage to new or existing underground utilities and structures.

C. In selection of grouting placement consider pipe flotation, length of pipe, length of tunnel, depth from surface and type of sewer pipe, type of pipe blocking and bulkheading, grout volume and length of pipe to be grouted between bulkheads.

D. Operate dewatering systems until grouting operations are complete and grout has reached initial set.

3.2 EQUIPMENT

A. Batch and mix grout in equipment of sufficient size and capacity to provide necessary quality and quantity of grout for each placement stage.

B. Use equipment for grouting of type and size generally used for the Work, capable of mixing grout to homogeneous consistency and providing means of accurately measuring grout component quantities and accurately measuring pumping pressures. Use pressure grout equipment which delivers grout to injection point at steady pressure.

3.3 ANNULAR GROUTING FOR SEWER/WATER LINE IN CASED OR UNCASED AUGERS

A. Fill annular space between sewer pipe and casing or ground, with grout.

B. Placement:

1. Placement Limits: Predetermine limits of each grout placement stage by size and capacity of batching equipment and initial set time of proposed grout. Under no circumstances shall placement continue at grout port longer than that period of time for mix to take initial set. Locate grout hole spacing and locations according to number of stages necessary to grout tunnel liners. Stage or lift cannot be installed on another lift until proper set has been attained. Have placement procedures approved by admixture or additive manufacturer.

2. Limit pressure on annular space to prevent damage or distortion to pipe. Define limiting and estimated required pressure range. Provide an open ended, high point tap or equivalent vent and monitor it at bulkhead opposite to point of grouting.

3. Pump grout until material discharging is similar in consistency to that at point of injection.

C. Remove temporary bulkheads installed for grouting.

D. Batch and mix cellular grout mechanically to ensure consistency of mix.

Wet solids thoroughly before introduction of foaming agent. Operate batching system to maintain slurry weight within three percent (3%) of design density. Introduce foam into slurry in accordance with manufacturer's recommendations.

3.4 PRESSURE GROUTING FOR JACKED PIPE

A. For jacked pipe sixty inches (60 In) in diameter or greater, pressure grout annulus after installation, displacing bentonite lubrication. Jacked pipes less than sixty inch (60 In) diameter may be left ungrouted unless excavated diameter exceeds external pipe diameter by more than one inch (1 In).

B. Inject grout through grout holes in sewer pipe. Drilling holes from surface or through carrier pipe walls is not allowed. Perform grouting by injecting it at pipe invert with bentonite displacement occurring through high point tap or vent.

C. Control ground water as necessary to permit completion of grouting without separation of grout materials.

D. Limit pressures to prevent damage or distortion to pipe or to keep flexible pipe within acceptable tolerances.

E. Pump grout until material discharging is similar in consistency to that at point of injection.

3.5 GROUND STABILIZATION GROUTING

A. Completely fill voids outside limits of excavation caused by caving or collapse of ground. Fill with gravity or pressure injected sand-cement grout as necessary to fill void.

B. Take care in grouting operations to prevent damage to adjacent utilities or public or private property. Grout at pressure that shall not distort or imperil portion of the Work or existing installations or structures.

C. Verify that void has been filled by volumetric comparisons and visual inspection. In case of settlement under existing slabs, take cores as directed by the Project Manager, at no additional cost to the City, to demonstrate that void has been filled.

3.6 FIELD QUALITY CONTROL

A. Annular Grouting for Sewer Line in Cased or Uncased Augers.

1. Make one (1) set of four (4) compressive test specimens for every two hundred feet (200 Ft) of sewer pipe installed in primary lined tunnel.

2. For cased or uncased augers, make one (1) set of four (4) compressive test specimens for each grouting operation or for each one hundred feet (100 Ft) of pipe installed, whichever is more frequent.

3. For cellular grout, check slurry density both at point of batching and placement at least twice each hour in accordance with ASTM C138. Record density, time and temperature. Density must be within three percent (3%) of design density at point of batching and five percent (5%) of design density at point of placement.

B. Pressure Grouting for Jacked Pipe. Make one (1) set of four (4) compressive test specimens for every four hundred feet (400 Ft) of jacked pipe pressure grouting.

C. Ground Stabilization Grouting. Make one (1) set of four (4) compressive test specimens for every location where ground stabilization grouting is performed.

D. All testing to be done in conformance with Section 01470 Testing Laboratory Services and Section 01475 Quality Control Testing Procedures.

END OF SECTION

SECTION 03200

REINFORCING STEEL

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Furnishing, fabrication and installation of all reinforcing bar, and for placement in concrete.

B. Requirements for placing, tying and supporting reinforcing steel in concrete.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES:

1. No separate payment shall be made for reinforcing steel used as part of a new cast-in-place structure or concrete paving. Include cost for labor, materials and equipment in the cost of the bid item for the structure or paving.

2. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ACI □ American Concrete Institute.

1. ACI 3 1813 18R □ Building Code Requirements for Reinforced Concrete and Commentary.

2. ACI SP-66 □ Detailing Manual.

B. AWS □ American Welding Society.

1. AWS □ D1.4 □ Structural Welding Code -Reinforcing Steel.

C. ASTM American Society for Testing and Materials.

1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.

3. ASTM A497 Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete Reinforcement.

4. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

5. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

6. ASTM A767 Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

7. ASTM A775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

D. CFTS City of Friendswood Technical Specifications.

1. Section 01270 Measurement and Payment.

2. Section 01330 Submittal Procedures.

E. CRSI Concrete Reinforcing Steel Institute.

1. Placing Reinforcing Bars.

2. Manual of Standard Practice.

F. ICBO International Conference of Building Officials.

1. ICBO Research Report.

G. WRI Wire Reinforcement Institute.

1. Manual of Standard Practice, Welded Wire Reinforcement.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 Submittal Procedures.

B. Action Submittals:

1. Shop Drawings prepared in accordance with CRSI Manual of Standard Practice and ACI SP-66 Detailing Manual:

a. Bending lists.

b. Placing drawings.

C. Informational Submittals:

1. Lab test reports for reinforcing steel showing stress-strain curves and ultimate strengths.

2. Mechanical Threaded Connections:

a. Current International Conference of Building Officials (ICBO) Research Report or equivalent code agency report listing findings to include acceptance, special inspection requirements, and restrictions.

b. Manufacturer s instructions.

c. Verification that device threads have been tested and meet requirements for thread quality, in accordance with manufacturers published methods.

D. Welding Qualification: Prior to welding, submit welder qualifications and nondestructive testing procedures.

E. Test results of field testing.

F. Shop drawings shall show all bars, sizes, dimensions, spacings, clearances, and placement patterns.

1.5 QUALITY ASSURANCE

A. Provide manufacturer s affidavits that steel was manufactured in compliance with standards referenced in this Section.

B. Provide manufacturer s affidavits that steel is American made and not imported.

C. Welder Qualifications: Certified in accordance with AWS D1.4.

D. Independent Testing Laboratory, contracted by the City, shall inspect all items that are welded and shall report results to the Project Manager.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Unload, store, and handle bars in accordance with CRSI publication "Placing Reinforcing Bars."

B. Reinforcing steel shall not remain on the ground for any length of time.

PART II: PRODUCTS

2.1 MATERIALS

A. Deformed Billet-Steel Reinforcing Bars:

1. Includes stirrups, ties, and spirals.

2. ASTM A615, Grade 60, where welding is not required.

3. ASTM A706/A706M, Grade 60, for reinforcing to be welded.

4. ASTM A767/767M, Grade 60, for galvanized bars.

B. Mechanical Splices and Connections:

1. Metal Sleeve Splice: Furnish with cast filler metal, capable of developing, in tension or compression, one hundred twenty-five percent (125%) of minimum tensile strength of bar. Manufacturer and Product:

a. Erico Products, Inc., Cleveland, OH, Cadweld T-Series.

2. Mechanical Threaded Connections: Furnish metal coupling sleeve with internal threads engaging threaded ends of bars developing in tension or compression one hundred twenty-five percent (125%) of yield strength of bar. Manufacturers and Products:

a. Erico Products, Inc., Cleveland, OH; Lenton Reinforcing Steel Couplers.

b. Richmond Screw Anchor Co., Inc., Fort Worth, TX;

Richmond DB-SAE Dowel Bar Splicers.

C. Welded Wire Reinforcement:

1. ASTM A185 or A497 and ACT 31 8/318R, using ASTM A82 wire of seventy-five kilo-pounds per square inch (75 ksi) minimum tensile strength.

2. Furnish flat sheets only; rolled sheets shall not be permitted.

2.2 ACCESSORIES

A. Tie Wire:

1. Black, soft-annealed sixteen (16) gauge wire.

2. Nylon-, epoxy-, or plastic-coated wire.

B. Bar Supports and Spacers:

1. Precast concrete bar supports, cementitious fiber-reinforced bar supports, or all-plastic bar supports and side form spacers meeting requirements of CRSI Manual of Standard Practice. Other types of supports or spacers shall not be permitted.

2. In concrete exposed to view after form removal: Small rectangular concrete blocks made up of same color and strength as concrete being placed around them, or all-plastic bar supports and side form spacers.

3. Precast concrete supports of same strength as concrete for reinforcing in concrete placed on grade.

4. Plastic Bar Supports: As manufactured by Aztec Concrete Accessories, Bloomington, CA.

2.3 FABRICATION

A. Follow CRSI Manual of Standard Practice.

B. Bend bars cold.

PART III: EXECUTION

3.1 PREPARATION

A. Notify the Project Manager when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.

B. Clean reinforcing bars of loose mill scale, oil, earth, and other contaminants.

C. Coat wire projecting from precast concrete bar supports with dielectric material, epoxy, or plastic.

3.2 REINFORCING BAR INSTALLATION

A. Bundle or space bars, instead of field bending, where construction access through reinforcing is necessary.

B. Spacing and Positioning: Conform to ACI 381/318R. There shall be a minimum of one inch (1 In) spacing between end of reinforcing bars and the face of the form.

C. Location Tolerances: In accordance with CRSI publication, "Placing Reinforcing Bars".

D. Splicing:

1. Follow ACI 318/1318R.

2. Use lap splices of not less than eighteen inches (18 In), unless otherwise shown on the Drawings or unless other methods are permitted in writing by the Project Manager.

3. Stagger splices in adjacent bars where indicated.

E. Mechanical Splices and Connections:

1. Use only in areas specifically approved in writing by the Project Manager.

2. Install threaded rods as recommended by manufacturer with threads totally engaged into coupling sleeve and in accordance with ICBO Research Report.

3. For metal sleeve splice, follow manufacturer's installation recommendations.

4. Maintain a minimum edge distance and concrete cover.

F. Tying Reinforcing Bars:

1. Tie every other intersection on mats.

2. All edges shall be one hundred percent (100%) tied.

3. No two (2) consecutive reinforcing bars in either direction shall be untied.

4. Bend ties wire away from concrete surface to provide clearance of one inch (1 In) from surface of concrete to tie wire.

G. Reinforcing Steel Mat Supports.

1. Reinforcing Steel Mat supports shall be either plastic, metal with plastic tips, or concrete brick only.

2. Supports shall be of the size and height needed to maintain position of reinforcing steel in the concrete.

3. Supports shall be installed underneath the crossing bar closest to the subgrade (bottom).

4. Supports shall be placed in a checkerboard fashion similar to that for tying of the reinforcing steel.

G. Reinforcement Around Openings: On each side and above and below pipe or opening, place an equivalent length and area of steel bars to replace steel bars cut for opening. Extend steel reinforcing a standard lap length beyond opening at each end.

H. Straightening and Re-bending: Field re-bending of reinforcing steel bars is not permitted.

I. Unless permitted by the Project Manager, do not cut reinforcing bars in the field.

3.3 WELDED WIRE REINFORCEMENT INSTALLATION

A. Use only where specifically shown.

B. Extend reinforcement to within two inches (2 In) of edges of slab, and lap splices at least eighteen inches (18 In).

C. Tie laps and splices securely at ends with tie wire, and at least every twenty-four inches (24 In).

D. Place welded wire reinforcement on concrete blocks and rigidly support equal to that provided for reinforcing bars. Do not use broken concrete, brick, or stone.

E. Follow ACI 318/1318R and current Manual of Standard Practice, Welded Wire Reinforcement.

F. Do not use rolled fabric or flat mats that have been rolled. Install flat sheets only.

3.4 TESTS AND INSPECTION

A. An independent testing agency shall be retained by the City to visually inspect and test reinforcing steel welds in accordance with AWS D1.4.

B. An independent testing agency shall be retained by the City to inspect each mechanical splice and verify each component is installed in accordance with manufacturer's instructions and ICBO Research Report.

C. Special inspection shall be provided by the City as indicated on the Drawings.

END OF SECTION

SECTION 03300

STRUCTURAL CONCRETE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements for materials, proportioning, batching, mixing, delivery, and testing of Portland Cement Concrete to be used for concrete paving, concrete structures, and all other types of concrete construction.

B. Requirements for furnishing, erecting and removing form work, constructing expansion, construction, and control joints.

C. Requirements for placing, curing, protecting and finishing of concrete.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. No payment will be made for concrete for utility construction under this Section. Include cost in applicable utility structure.

2. Obtain services of and pay for certified testing laboratory to prepare design mixes.

3. Refer to Section 01270 □ Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES

A. ACI □ American Concrete Institute.

1. ACI 117 □ Standard Tolerances for Concrete Construction and Materials.

2. ACI 211.1 □ Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

3. ACI 302.1R Guide for Concrete Floor and Slab Construction.

4. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete.

5. ACI 308 Standard Practice for Curing Concrete.

6. ACI 309R Guide for Consolidation of Concrete.

7. ACI 311 Guide for Concrete Plant Inspection and Field Testing of Ready-Mix Concrete.

8. ACI 315 Details and Detailing of Concrete Reinforcement.

9. ACI 318 Building Code Requirements for Reinforced Concrete and Commentary.

10. ACI 544 Guide for Specifying, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete.

B. ASTM American Standards and Testing of Materials.

1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

3. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

4. ASTM A767 Standard Specifications for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

5. ASTM A775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

6. ASTM A820 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

7. ASTM A884 Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

8. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

9. ASTM C33 – Standard Specification for Concrete Aggregates.

10. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

11. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

12. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

13. ASTM C138 – Standard Test Method for Unit Weight Yield and Air Content (Gravimetric) of Concrete.

14. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.

15. ASTM C150 – Standard Specification for Portland Cement.

16. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

17. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

18. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

19. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

20. ASTM C309 – Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

21. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

22. ASTM C595 – Standard Specification for Blended Hydraulic Cements.

23. ASTM C685 – Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

24. ASTM C618 – Standard Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete.

25. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

26. ASTM C1077 – Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

C. CFTS – City of Friendswood Technical Specifications.

1. Section 01270 – Measurement and Payment.

2. Section 01330 – Submittal Procedures.

3. Section 01470 – Testing Laboratory Services.

4. Section 01475 – Quality Control Testing Procedures.

5. Section 02820 – Concrete Sidewalks.

6. Section 02825 – Colored Concrete for Wheelchair Ramps.

D. CRSI – Concrete Reinforcing Steel Institute.

1. CRSI MSP-1 – Manual of Standard Practice.

2. CRSI – Placing Reinforcing Bars.

E. Federal Specifications.

1. Federal Specification SS-S-210A – Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

F. NRMCA – National Ready Mix Concrete Association

1. Concrete Plant Standards.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit proposed mix design and test data prepared by a certified testing laboratory for each type and strength of concrete in Work.

C. Submit laboratory reports prepared by independent testing laboratory stating that all material used in concrete mix design comply with

requirements in this Section.

D. Submit manufacturer s mill certificates for reinforcing steel. Provide specimens for testing when required by Project Manager.

E. Submit certification from concrete supplier that all materials and equipment used to produce and deliver concrete comply with this Technical Specification.

F. When required on The Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

1.5 CONCRETE CLASSIFICATION AND USE

A. Classifications of concrete are for specific use and material only. Compressive Strengths shall vary depending on Designs, Details and Individual Technical Specifications, but at a minimum shall meet the minimum requirements as Specified in TABLE 4.1 CONCRETE CLASSIFICATION MINIMUM REQUIREMENTS.

B. Class of concrete shall be identified as follows:

1. Class A Concrete Paving, drilled shafts, non-structural culverts, inlets, manholes, curb, curb and gutter, sidewalk, driveway, wheelchair ramp, pilot channel and slope paving.

2. Class B Concrete Paving, structural culverts, wingwall, headwall and bridge structures.

3. Class C Concrete Small signs, anchors, and pipe blocking.

4. Class D Concrete Seal slab.

5. Class E Concrete Prestressed concrete beams, boxes and traffic barriers.

6. Class F High Early Strength concrete for traffic surfaces only and only with approval of Director of Community Development.

1.6 HANDLING AND STORAGE

A. Cement: Store cement off of ground in well-ventilated, weatherproof building to prevent deterioration or exposure to moisture. Different brands of cement or same brand from different sources shall not be

used unless approved by the Director of Community Development or the Project Manager.

B. Aggregates: All aggregates shall be transported and stockpiled separately according to their sources and gradations. Aggregates shall be handled in accordance with ACI requirements to prevent segregation and loss of fines or contamination with foreign materials.

1. If aggregates show segregation or the different grades become mixed, aggregates shall be re-screened before placing in the proportioning bins.

2. Aggregates from different sources or different gradations shall be segregated to prevent intermixing. Mixing of aggregates in stockpiles shall not be permitted.

3. No aggregate shall be transferred to proportioning bins when the moisture content of the aggregate is such that it will affect the accuracy of proportioning. Such aggregates shall be removed and stockpiled until a dry surface condition is obtained.

PART II: PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland cement concrete shall be composed of Portland cement fine aggregate, coarse aggregate, water and admixtures as approved by the Project Manager and shall be proportioned and mixed as specified in this Section.

B. Cementitious Material:

1. Portland Cement: ASTM C150, Type I/II, unless use of Type III is authorized by Project Manager; or ASTM C595, Type IP. For concrete in contact with sewage use Type II cement.

2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding four pounds per cubic yard (4 Lbs/Cy) alkali content in form of $Na_2O + 0.658K_20$.

C. Water: Clean, free from harmful amounts of oils, acids, alkalis, organic or other deleterious substances, and meeting requirements of ASTM C94. Water from municipal supplies approved by State agencies will not require testing, but water from other sources shall be tested before use in concrete.

1. Tests shall be made in accordance with AASHTO T26. One gallon (1 Gal) shall be taken to qualified testing laboratory for testing.

2. Water used in white Portland cement concrete shall be free from iron and other impurities which may cause staining or discoloration.

D. Aggregate:

1. Coarse Aggregate: ASTM C33. Unless otherwise indicated, use following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than one-fifth (1/5) of narrowest dimension between sides of forms, nor larger than three-quarters (3/4) of minimum clear spacing between reinforcing bars. Coarse aggregates shall meet the requirements as specified in TABLE 4.2 COARSE AGGREGATE GRADATION in this Section.

   a. Coarse aggregate material shall be made of either durable crushed or uncrushed gravel, crushed stone having uniform quality throughout. All coarse aggregate material shall have a wear of not more than forty percent (40%).

   b. Deleterious substance shall have a maximum permissible percentage by weight as specified in TABLE 4.3 DELETERIOUS SUBSTANCES in this Section. Aggregate to be free from excess of salt, alkali, vegetable matter or other objectionable material either free or as adherent coating.

2. Fine Aggregate: ASTM C33. Fine aggregates shall meet the requirements as specified in TABLE 4.4 FINE AGGREGATE GRADATION in this Section. Fine aggregates shall be sand or combination of sand and not more than fifty percent (50%) stone screenings.

   a. Sand shall be clean, hard, durable and uncoated grains.

   b. Stone screenings shall be clean, hard, durable and uncoated fragments resulting from crushing of stone.

3. Determine potential reactivity of fine and coarse aggregate in

accordance with Appendix to ASTM C33.

4. Mineral filler The addition of stone dust and/or sand as filler in Portland Cement Concrete paving may be used when approved by the Project Manager. Stone dust and sand shall be of acceptable quality and cleanliness as a mineral filler to improve workability and plasticity of the concrete mixture, in amounts not to exceed fifteen percent (15%) of the weight of fine aggregate. When tested with standard laboratory sieves, the mineral filler shall meet the requirements as specified in TABLE 4.5 MINERAL FILLERS in this Section. Fly Ash shall not be used as a filler unless approved by the Director of Community Development. If approval has been granted for use of Fly Ash, then fly ash shall conform to ASTM C618.

E. Air Entraining Admixtures: An air entraining agent shall be required and shall conform to ASTM C260. Air entrainment shall be four percent (4%) plus or minus one percent (±1%) for all concrete classes and verified for conformity in the field by a certified testing laboratory. Concrete with air entrainment quantity of five percent and one-half (5.5%) to seven percent (7.0%) may be accepted on condition of passing twenty-eight day (28 D) compressive strength tests and approval of the Project Manager. Concrete with air entrainment quantity greater than seven percent (7%) or less than two percent (2%) shall be rejected. Air content shall be determined by ASTM C138 or ASTM C173. No air entrainment shall be required for seal slabs.

F. Chemical Admixtures:

1. Water Reducers: ASTM C494, Type A.

2. Water Reducing Retarders: ASTM C494, Type D.

3. High Range Water Reducers (Superplasticizers): ASTM C494, Types F and G.

G. Prohibited Admixtures: No admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of one tenth of a percent (0.1%) by weight of cement shall be used in concrete mixes.

H. Fiber:

1. Fibrillated Polypropylene Fiber:

a. Addition Rate: One and one-half pounds (1-1/2 Lbs) of

fiber per cubic yard of concrete.

b. Physical Properties:

(1) Material: Polypropylene.

(2) Length: One-half inch (1/2 In) or greater.

(3) Specific Gravity: 0.91.

c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.

2. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A820.

a. Ratio: Fifty pounds (50 Lbs) to two hundred pounds (200 Lbs) of fiber per cubic yard of concrete.

b. Physical Properties.

(1) Material: Steel.

(2) Aspect Ratio [for fiber lengths of one-half inch (1/2 In) to two and one-half inch (2-1/2 In), length divided by diameter or equivalent diameter]: Thirty to One (30:1) □ one hundred to one (100:1).

(3) Specific Gravity: 7.8.

(4) Tensile Strength: Forty kilo-pounds per square inch (40 ksi) □ four hundred kilo-pounds per square inch (400 ksi).

(5) Young□s Modulus: Twenty-nine thousand kilo-pounds per square inch (29,000 ksi).

(6) Minimum Average Tensile Strength: Fifty thousand kilo-pounds per square inch (50,000 psi).

(7) Bending Requirements: Withstand bending around one eighth inch (0.125 In) diameter mandrel to angle of ninety degrees Fahrenheit (90° F), at temperatures not less than sixty degrees Fahrenheit (60° F), without breaking.

I. Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C309.

2.2 PRODUCTION METHODS

A. Use either ready-mixed concrete from a source approved by the Director of Community Development conforming to requirements of ASTM C94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C685.

2.3 MEASUREMENT OF MATERIALS

A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C685.

B. Measure water and liquid admixtures by volume.

2.4 DESIGN MIX

A. Use design mixes prepared by certified testing laboratory in accordance with ASTM C1077 and conforming to requirements of this Section. Design shall be based on the required over-design factor according to ASTM C94 and assuming a coefficient of variation equal to fifteen (15). The average of three (3) consecutive strength tests shall be equal to or greater than the specified strength. Classification shall meet the requirements as specified in TABLE 4.1 CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS in this Section.

B. Proportion of concrete materials shall be based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this Specification. Submit concrete mix designs to Project Manager for review and approval.

C. Variations in proportions of concrete may be based on field experience or trial mixtures, in accordance with requirements at Section 5.3 of ACI 318, may be made, but only when approved by Project Manager.

D. Proportioning of Portland Cement and water shall meet the requirements as specified in TABLE 4.1 CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS in this Section.

E. Add steel or polypropylene fibers only when called for on The Drawings or in another Section of these Technical Specifications.

F. Determine air content in accordance with ASTM C138, ASTM C173 or ASTM C231.

G. Once a design mix for any class of concrete has been approved by the Project Manager, the mix shall not be varied as to source, quantity, quality, grading of materials, proportioning of any other way except as allowed for moisture adjustment and tolerances as specified in ASTM C685.

PART III: EXECUTION

3.1 BATCHING AND MIXING

A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C94, Sections 8 through 11. Produce ready-mixed concrete using automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 Plant Control Systems.

B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C685, Sections 6 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Project Manager before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C685, Section 14. Water withheld from the mix shall also be noted on the batch ticket. In addition to the referenced information, each batch ticket shall also include the design mix information so that the batch can be compared on site to the mix design.

E. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

F. Moisture Control:

1. At the time of batching, all aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing.

2. In no event shall the free moisture content of the fine aggregate at the time of batching exceed eight percent (8%) of its saturated, surface-dry weight. The batch-to-batch uniformity of all aggregates shall be such that variations in moisture content within one hour (1 Hr) do not exceed twelve pounds (12 Lbs) in the batch quantity for one cubic yard (1 Cy) of concrete, or that a gradual change does not exceed twenty-four pounds (24 Lbs) in a period of four hours (4 Hrs).

3. The Contractor shall install, and maintain in operating condition, an electrically actuated moisture meter which will indicate on a readily visible scale the percentage of moisture in the fine aggregate as it is batched, within a sensitivity of one-half percent (1/2%) by weight of the fine aggregate.

G. Scales

1. Scales shall be used for the accurate measurement of each of the materials entering each batch of concrete.

2. If scales are of the dial type, the dial shall be of such size and so arranged that it may be read easily from the operating platform.

3. If scales are of the multiple beam type, the scales shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or underweight. The indicator shall be so designed that it will operate during the addition of the last two hundred pounds (200 Lbs) of material of any weighing. The over-travel of the indicator hand shall be at least one-third (1/3) of the loading travel. Indicators shall be enclosed to protect against moisture and dust.

4. Scales shall be tested by a commercial scale company and certified that the scales meet all requirement for weighing equipment. Certification shall be required whenever a scale is relocated, and at least once every six months (6 Mos). Copies of the certifications shall be provided to the Project Manager when requested.

H. Recorders

1. An accurate recorder shall be provided for producing a digital printout of the batch number and scale readings corresponding to each of the ingredients of each concrete batch, including

zero (0) initial readings. The individual ingredients shall be indicated by name or code corresponding to each weight.

2. Each printout shall indicate date and time of batching, identification number identical to that of the concrete delivery ticket and codes for the mix design and of the Work.

3. The printout shall be prepared in duplicate, with one (1) copy delivered together with its corresponding concrete delivery ticket to the Project Manager, as specified herein before.

4. Each recorder mechanism shall be enclosed in a locked, dust tight cabinet and shall be placed in a position convenient for observation.

3.2 DELIVERY AND DELIVERY EQUIPMENT

A. Hand-mixed concrete shall be made in batches not larger than one-third cubic yard (1/3 Cy) and only with approval of the Project Manager. Concrete shall be Sakrete or approved equal, no separate proportioning of materials outside of a batch plant will be allowed. Batching shall be in accordance with manufactures directions and stated measurements.

1. Mixing of concrete shall be in a clean, water tight mixing box.

2. Introduce measured amount of clean water.

3. Mix water and cement a minimum of six (6) turns or until batch maintains uniform color and consistency.

4. At no time shall bags of Sakrete be put in place, sliced open and water added in a ditch or hole.

B. Pumping and pneumatic conveying equipment shall be of a suitable kind with adequate pumping capacity. Equipment shall be cleaned at the end of each operation. Pneumatic placement shall be controlled so that segregation does not occur in the discharged concrete. Concrete shall not be conveyed through any pipe made of aluminum or aluminum alloy.

C. Transit mix trucks shall be in good working order. All trucks shall have the following operational, delivery and placing conditions and equipment:

1. Actuated drum revolution counter shall be in good working order.

a. Batch shall be mixed at the plant between fifty (50) and seventy (70) revolutions before being transported to site.

b. At no time shall a batch be placed when mixed less than seventy (70) revolutions or more than 100 revolutions, except as noted in 3.2.C.1.c.

c. Batch shall be mixed for a minimum of twenty-five (25) revolutions after additional water has been introduced into the mix on site. This procedure shall be repeated for each instance when water is added.

2. Water supply reserve tank shall be supplied on each truck.

a. Water tank shall be full on arrival at site.

b. Water tank shall have accurate scale to measure gallons of water to be introduced to truck mixer.

c. Project Manger shall verify the amount of water used on site for mixing and verify the recording on the trip ticket.

3. Drum mixer shall be watertight and shall be free of hardened concrete and shall have fins that are capable of thoroughly mixing concrete.

4. Any defective equipment that cannot meet the Specifications of 3.2.C shall not be allowed on site until the deficiencies have been corrected.

3.3 PLACING CONCRETE

A. Give sufficient advance notice to the Project Manager [at least forty-eight hours (48 Hrs) prior to commencement of operations] to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to the Project Manager's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, when necessary to continue after daylight hours, site shall be illuminated completely as required. When rainfall occurs after placing operations are started, provide covering to protect work.

C. Subgrade surface shall be sprinkled sufficiently with water to prevent absorption of water from freshly placed concrete.

D. Forms and rebar shall be cleaned of all foreign materials; subgrade shall be free of all trash and other materials.

E. Batches that do not have computer batch tickets or delivery tickets shall be refused. Once a truck has been refused for any reason it shall leave the site. Attempts to fix deficiencies on site shall not be allowed.

F. Temperature specifications for placement of concrete shall be as follows and as specified in TABLE 4.6 TEMPERATURE REQUIREMENTS FOR PLACEMENT in this Section:

1. Ambient (Air) temperature shall be taken in the shade and shielded from direct sunlight and wind.

2. Minimum ambient temperature for concrete placement shall be thirty-five degrees Fahrenheit (35° F) and rising. At no time shall concrete be placed when ambient temperature is below forty degrees Fahrenheit (40° F) and falling.

3. Maximum ambient temperature shall be ninety degrees Fahrenheit (90° F). Addition of ice to concrete mix shall allow ambient temperature maximum to be one hundred degrees Fahrenheit (100° F), upon approval of the Project Manager.

4. Minimum concrete temperature shall be fifty degrees Fahrenheit (50° F).

5. Maximum concrete temperature shall be ninety degrees Fahrenheit (90° F). Addition of ice shall permit the maximum temperature to be ninety-five degrees Fahrenheit (95° F). At no time shall any concrete be placed when concrete temperature exceeds ninety-five degrees Fahrenheit (95° F).

G. When adverse weather conditions affect quality of concrete, postpone concrete placement. Protect placed concrete from temperatures below thirty-two degrees Fahrenheit (32° F) until concrete has cured for minimum of three days (3 D) at seventy degrees Fahrenheit (70° F) or five days (5 D) at fifty degrees Fahrenheit (50° F).

H. Time constraints Concrete shall be placed so that there is no more than one hour (1 Hr) of time elapsed from last discharge to next discharge. Addition of allowable dosage of water retardation agent

shall extend time limit by one-half hour (1/2 Hr). Limit on time from batch to placement shall be as specified in TABLE 4.7 TRANSPORTING TIME REQUIREMENTS in this Section.

I. If no water has been withheld from the mix at the plant, then addition of water to mix on site shall not exceed two gallons per cubic yard (2 Gal/Cy) of concrete. If water has been withheld, then up to the amount withheld can be added upon approval of the Project Manager. Any additional water above that, but not to exceed two gallons per cubic yard (2 Gal/Cy), shall be added only with the approval of the Project Manager. At no time shall slump exceed mix design nor be more than one and one-half inches (1-1/2 In) less than specified slump. All water that has been added to the truck shall be written on the trip ticket and batch ticket by the Project Manager.

J. Use troughs, pipes and chutes lined with approved metal or synthetic material for placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum or aluminum alloy material to come in contact with concrete.

K. Limit free fall of concrete to four feet (4 Ft). Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken initial set, and do not place strain on projecting reinforcement rods or anchor bolts.

L. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, or provide in several lengths, so that outlet may be adjusted to proper height during placing operations.

M. Place concrete in continuous horizontal layers approximately twelve inches (12 In) thick. Place each layer while layer below is still plastic.

N. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move vibrator vertically through layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.

O. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R

and ACI 309R.

3.4 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Sections 01470 Testing Laboratory Services and 01475 Quality Control Testing Procedures.

B. Unless otherwise directed by the Project Manager, the following minimum testing of concrete shall be required. Testing shall be performed by qualified individuals employed by approved independent testing laboratory, and conform to requirements of ASTM C1077.

1. Take concrete samples in accordance with ASTM C172.

2. Make one (1) set of compression test specimens for each mix design at least once per day and for each one hundred cubic yards (100 Cy) or fraction thereof. Make, cure and test specimens in accordance with ASTM C31 and ASTM C39.

a. Tests are representative random sampling of each one hundred cubic yard (100 Cy) unit placement of concrete. Passing or failure of compressive testing shall represent all one hundred cubic yard (100 Cy) for acceptance or deficiency.

3. When taking compression test specimens, test each sample for slump according to ASTM C143, for temperature according to ASTM C1064, for air content according to ASTM C231, and for unit weight according to ASTM C138.

4. Inspect, sample and test concrete in accordance with ASTM C94, Section 13, 14, and 15, and ACI 311-5R.

C. Test Cores: Conform to ASTM C42.

D. Testing High Early Strength Concrete: When Type III cement is used in concrete, specified seven day (7 D) and twenty-eight day (28 D) compressive strengths shall be applicable at three days (3 D) and seven days (7 D), respectively.

E. Seven day (7 D) compressive strengths shall be seventy (70%) percent of twenty-eight day (28 D) strength requirement.

F. If twenty-eight day (28 D) compressive strengths fail to meet class specified requirements, then those portions of structure represented by

test specimens shall be replaced at no additional cost to City.

G. Take one (1) slump test a minimum of every fifty cubic yards (50 Cy) of placement according to ASTM C143. Project Manager shall be authorized to have testing laboratory take slump on any questionable concrete.

3.5 FINISHING

A. Burlap drag or transverse broom for finishing slab.

1. Burlap Finish Furnish four (4) plies of ten ounce (10 oz) burlap material fastened to bridge to form continuous strip of burlap full width of pavement. Maintain contact three foot (3 Ft) width of burlap material with pavement surface. Keep burlap drags clean and free of encrusted mortar. Burlap shall be dragged longitudinally (parallel) with the centerline of the roadway. Finish look shall be straight lined. Swoops, diagonals or ridges shall not be allowed.

2. Broom Finish Furnish brooms with either horsehair or synthetic fiber bristles. Straw bristles shall not be allowed. Keep bristles clean and free of encrusted mortar. Broom shall be dragged latitudinally (perpendicular) with the centerline of the roadway. Adequate combination of pressure and bristle thickness shall be used to provide medium to heavy texture. Finish look shall be straight lined. Swoops, diagonals or ridges shall not be allowed.

3. Fire hose finishing shall not be allowed.

B. Finishing for patches and structures shall conform to the following requirements.

1. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one part cement to two parts fine aggregate. Repair defects by cutting out unsatisfactory material and replacing with new concrete, securely keyed and bonded to existing concrete. Finish to make junctures between patches and existing concrete as inconspicuous as possible. Use stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with surface.

2. Apply rubbed finish to exposed surfaces of formed concrete

structures as noted on The Drawings. After pointing has set sufficiently, wet surface with brush and perform first surface rubbing with No. 16 carborundum stone, or approved equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce smooth, dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on surface to reset; then wash surface with clean water. Leave structure with clean, neat and uniform-appearing finish.

C. Finish tolerances shall be as follows:

1. Top concrete surface of sidewalks shall be true planes within one-quarter inch (1/4 In) in ten feet (10 Ft).

2. Wheelchair ramps shall be held to tolerances as stated in Sections 02820 □ Concrete Sidewalks and 02825 □ Colored Concrete for Wheelchair Ramps.

3. Roadway slabs parallel to the centerline shall be true planes within one-sixteenth inch (1/16 In) in ten feet (10 Ft).

4 All other surfaces shall be true planes within one-quarter inch (1/4 In) in ten feet (10 Ft).

5. All tolerances shall be checked with a steel edge that has zero (0) tolerance deviation.

3.6 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for period of seven (7) curing days when Type II or IP cement has been used and for three (3) curing days when Type III cement has been used. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. A curing day is any calendar day in which temperature is above fifty degrees Fahrenheit (50° F) for at least nineteen hours (19 Hrs). Colder days may be counted when air temperature adjacent to concrete is maintained above fifty degrees Fahrenheit (50° F). In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at end of calendar days equal to twice required number of curing days. However, leave soffit forms and shores in place until concrete has reached specified twenty-eight day

(28 D) strength, unless directed otherwise by the Project Manager.

1. Moisture Cover Curing Method: The concrete surfaces to be cured shall be covered with specific moisture-retaining cover material placed in the widest practical width with sides and ends lapped at least three inches (3 In) and sealed by waterproofing tape or adhesive. All holes or tears that develop during curing period shall be repaired immediately. Minimum curing time for this method shall be seven days (7 D).

2. Liquid Membrane Curing: The specified membrane curing compound shall be applied to damp concrete surfaces as soon as possible after the final finishing operations are complete, but in no case later than two hours (2 Hrs) after finishing. Curing compound shall be applied uniformly over the concrete surfaces by means of approved spray equipment in accordance manufacturer's instruction. No deformities (tear drop, pattern, etc.) shall be accepted. Should the cure coat be damaged from any cause during the curing period, damaged portions shall be repaired and recoated immediately with additional compound.

B. Formed surfaces not requiring rubbed-finished surface shall be cured by leaving forms in place for full curing period. Keep wood forms wet during curing period. Add water as needed for other types of forms. Non-structural concrete forms, upon approval of the Project Manager, may be removed after two days (2 D) and curing compound applied.

C. Rubbed Finish:

1. For formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging surface.

2. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received final finish and surplus water sheen has disappeared, immediately seal surface with uniform coating of approved curing compound, applied at rate of coverage recommended by manufacturer or as directed by the Project Manager. Do not apply less than one gallon (1 Gal) per one hundred eighty square feet (180 Sf) of area. Provide satisfactory means to properly control and check rate of

application of compound.

2. Thoroughly agitate compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.

3. Do not apply compound to dry surface. When concrete surface has become dry, thoroughly moisten surface immediately prior to application of compound. At locations where coating shows discontinuities, pinholes or other defects, or when rain falls on newly coated surface before film has dried sufficiently to resist damage, additional coat of compound shall be applied at specified rate of coverage.

3.7 PROTECTION

A. Protect concrete against damage until final acceptance by City.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide protection while concrete is still plastic, and whenever precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of structure needed to resist loading are complete and have reached specified twenty-eight day (28 D) compressive strength, except as authorized otherwise by the Project Manager.

D. Concrete pavement shall not be used before the twenty-eight day (28 D) compressive strength unless the seven day (7 D) compressive strength test has reached the twenty-eight day (28 D) strength requirement. Pavement can be used for light vehicles only after the twenty-eight day (28 D) strength has been met. At no time shall any equipment or vehicles heavier than eight thousand pounds (8000 Lbs) GVW (Gross Vehicle Weight) be allowed on pavement before it passes the twenty-eight day (28 D) compressive strength tests.

3.8 REMOVAL OF FORMS AND SHORING

A. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses. Remove forms from vertical surfaces not requiring rubbed-finish when concrete has aged for required number of curing days. When curing compound is used, do not remove forms

before during first (1st) two (2) full days after concrete placement.

B. Leave soffit forms and shores in place until concrete has reached specified twenty-eight day (28 D) strength, unless directed otherwise by the Project Manager.

3.9 DEFECTIVE WORK

A. Immediately repair defective work discovered after forms have been removed. When concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace entire section.

PART IV:TABLES

4.1 CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS

CONCRETE CLASSIFICATION MINIMUM SPECIFICATIONS					
Class of Concrete	Sacks of Cement per Cubic Yard Minimum	Minimum Compressive Strength at 28 Days	Maximum Cement to Water Ratio	Coarse Aggregate Grade Number	Slump
A	5.0	3000**	6.25	2 □3	3 □5*
B	6.0	3600**	6.00	1,2,3,4,5	4
C	4.0	2000**	8.00	2,3,4,5,6,7	5
D	6.0	3000**	6.00	2,3,4,5	5
E	6.0	As specified	5.50	3,4,5,6	5
F	8.75	5500**	3.6	6	5

*When ASTM C494, Type F or Type G admixture is used to increase workability, this range may be 6 to 9.

**These are minimum compressive strengths; please note a mix design is required for various applications to ensure specified compressive strengths are met for their intended use.

4.2 COARSE AGGREGATE GRADATION

COARSE AGGREGATE GRADATION CHART										
Aggregate Grade No.	Nominal Size Inches	Percent Retained on Each Sieve								
		2-1/2 In.	2 In.	1-1/2 In.	1 In.	3/4 In.	1/2 In.	3/8 In.	No. 4	No. 8
1	2	0	0-20	15-50		60-80			95-100	
2 (467)*	1-1/2		0	0-5		30-65		70-90	95-100	
3	1-1/2		0	0-5		10-40	40-75		95-100	
4 (57)*	1			0	0-5		40-75		90-100	95-100
5 (67)*	3/4				0	0-10		45-80	90-100	95-100
6 (7)*	1/2					0	0-10	30-60	85-100	95-100
7	3/8						0	5-30	75-100	
8	3/8						0	0-5	35-80	90-100

* Numbers in parenthesis indicate that the gradations conform to Corresponding ASTM gradation in ASTM C33.

4.3 DELETERIOUS SUBSTANCES

MAXIMUM PERMISSIBLE PERCENTAGES	
Deleterious Material	Maximum Percentage
Material removed by decantation, ASTM C117	1.0 %
Shale, slate or similar materials	1.0 %
Clay lumps	0.25 %
Soft fragments	3.0 %
Others, including friable, thin, elongated or laminated pieces	3.0 %

Sum of all deleterious ingredients, exclusive of material removed by decantation shall not exceed 5 % by weight.

4.4 FINE AGGREGATE GRADATION

FINE AGGREGATE GRADATION CHART								
Aggregate Grade No.	Percent Retained on Each Sieve							
	3/8 In.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
1	0	0-5	0-20	15-50	35-75	65-90	90-100	97-100

4.5 MINERAL FILLERS

MINERAL FILLER GRADATION CHART		
Percent Retained on Each Sieve		
No. 20	No. 30	No. 100
0 %	0 to 5 %	0 to 30 %

4.6 TEMPERATURE REQUIREMENTS FOR PLACEMENT

PLACEMENT TEMPERATURE REQUIREMENTS	
AMBIENT TEMPERATURE[1]	
Minimum temperature to start placing concrete	35° and rising
Minimum temperature to stop placing concrete	40° and falling
Maximum temperature for placing concrete without ice	90°
Maximum temperature for placing concrete with ice	100°
CONCRETE TEMPERATURE	
Minimum concrete temperature	50°
Maximum concrete temperature without ice	90°
Maximum concrete temperature with ice	95°
MINIMUM CURING TIMES WHEN PLACED CONCRETE HAS BEEN EXPOSED TO FREEZING TEMPERATURES	
From 50° to 70°, minimum days	5
70° and above, minimum days	3
[1]Ambient temperature is to be taken as specified in paragraph 3.3.F.1 of this Section.	

4.7 TRANSPORTING TIME REQUIREMENTS

TRANSPORTING TIME REQUIREMENTS FOR PLACEMENT		
Ambient Temperature	Maximum Time (No Retarding Agent) in Minutes	Maximum Time (With Retarding Agent) in Minutes[1]
Non-Agitated Concrete		
Above 80° F	15	30
80° F and Below	30	45
Agitated Concrete		
Above 90° F	45	75
75° F to 90° F	60	90
75° F and Below	90	120
NOTE: Time interval shall be from the addition of cement to the batch to start of placement of concrete in the forms. [1]Normal Dosage of retarder.		

END OF SECTION

100% SUBMITTAL

GRADING, DRAINAGE AND UTILITIES

TO SERVE

COWARD CREEK - TRIBUTARY II

NOTE:

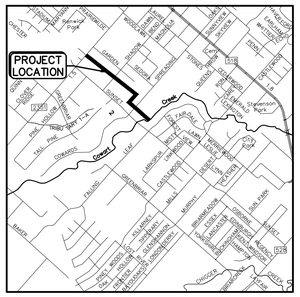
COWARDS CREEK,COWARD CREEK AND COWART CREEK ARE USED INTERCHANGEABLY
ON GLO GRANT DOCUMENTS AND ALL REFER TO THE SAME PROJECT

CITY OF FRIENDSWOOD, GALVESTON COUNTY, TEXAS

JUNE, 2017

GLO CONTRACT NO. 13-465-000-7974
WORK ORDER NO. 7975
GLO BIO PACKAGE NO. 22801-1-BID 4
PROJECT NO. P21472-5 COWART CREEK TRIBUTARY TWO

DRAWING INDEX	
Sheet Number	Sheet Title
1	COVER SHEET
2	GENERAL CONSTRUCTION NOTES
3	GENERAL LAYOUT
4	PLAN AND PROFILE STA. 0+00 TO 10+00
5	PLAN AND PROFILE STA 10+00 TO 20+00
6	PLAN AND PROFILE STA. 20+00 TO 30+00
7	PLAN AND PROFILE STA. 30+00 TO END
8	PLAN AND PROFILE LATERAL A
9	CROSS SECTION
10	STORM WATER POLLUTION PREVENTION PLAN
11	STORM WATER POLLUTION PREVENTION DETAILS
12	CITY OF FRIENDSWOOD STORM SEWER DETAILS
13	CITY OF FRIENDSWOOD PAVING DETAILS
14	MISCELLANEOUS DETAILS
15	GCCDD STANDARD DETAILS 1
16	GCCDD STANDARD DETAILS 2
17	TXDOT 1
18	TXDOT 2
19	TXDOT 3
20	TXDOT 4
21	EXHIBIT OF EASEMENTS



VICINITY MAP
SCALE: 1" = 1/2 MI.
BEGIN-29°31'37"N, 95°12'47"W
END-29°31'14"N, 95°12'20"W
KEY MAP : 656-C

GALVESTON COUNTY

COUNTY JUDGE	MARK HENRY
COMMISSIONER, PRECINT 1	RYAN DENNARD
COMMISSIONER, PRECINT 2	JOE GIUSTI
COMMISSIONER, PRECINT 3	STEPHEN HOLMES
COMMISSIONER, PRECINT 4	KEN CLARK
COUNTY ENGINEER	MICHAEL SHANNON, P.E.

GALVESTON COUNTY CONSOLIDATED DRAINAGE DISTRICT

CHAIRMAN	HAROLD WHITAKER
SECRETARY	BENNY BAKER
POSITION 2	GARY HARRIS
POSITION 3	CARL HORECKY
POSITION 5	DON BARCAK

CITY OF FRIENDSWOOD

MAYOR	KEVIN M. HOLLAND
MAYOR PRO-TEM	JIM HILL
POSITION 1	STEVE ROCKEY
POSITION 2	BILLY ENOCHS
POSITION 4	PATRICK J. MCGINNIS
POSITION 5	JOHN H. SCOTT
POSITION 6	CARL W. GUSTAFSON
CITY MANAGER	ROGER ROECKER

LENTZ ENGINEERING

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
10/26/17

MORAD KABIRI, P.E., AICP
DIRECTOR OF COMMUNITY DEVELOPMENT
DATE

KAZ HAMIDIAN
DIRECTOR OF PUBLIC WORKS
DATE

NOTE:

THIS IS TO CERTIFY THAT THE ABOVE SIGNED HAVE REVIEWED ALL SHEETS PROVIDED AND FOUND THEM TO BE IN GENERAL COMPLIANCE WITH THE REQUIREMENTS ESTABLISHED BY THE CITY OF FRIENDSWOOD. THIS APPROVAL IS ONLY VALID FOR THREE HUNDRED SIXTY-FIVE (365) CALENDAR DAYS. PLEASE NOTE, THIS DOES NOT NECESSARILY MEAN THAT ALL THE CALCULATIONS PROVIDED IN THE PLANS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THE PLANS SUBMITTED HAVE BEEN PREPARED, SIGNED AND SEALD BY A PROFESSINAL ENGINEER LICENSED TO PRACTICE ENGINEERING N THE STATE OF TEXAS, WHICH CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY.

THIS DOCUMENT AND RELATED DETAILS REMAIN THE PROPERTY OF LENTZ ENGINEERING, LLC. THIS DOCUMENT IS NOT TO BE SOLD, COPIED, OR REPRODUCED WHOLE OR IN PART, WITHOUT THE CONSENT OF LENTZ ENGINEERING, LLC.

13092 COWARD CREEK - TRIBUTARY II

F:\Data\2013\13092 CDBG - TRIBUTARY II\Lentz\13092MASTER.dwg June 26, 2017 7:43:07 AM Rudy De Hayos

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISED CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
2. TRENCH SAFETY SYSTEM TO MEET, AS A MINIMUM, THE REQUIREMENTS OF OSHA SAFETY AND HEALTH REGULATIONS, LATEST EDITION.
3. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713-223-4567) FOR CENTERPOINT, TEXAS-NEW MEXICO POWER AND AT&T TELEPHONE AND TEXAS ONE-CALL SYSTEM (1-800-245-4545) FOR PIPELINES AND CABLE TV.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE DEPTH, LOCATION AND EXISTENCE OF ALL EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION.
5. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE COMMENCING WORK. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY AND ALL DISCREPANCIES TO THE OWNER AND THE ENGINEER IN A TIMELY MANNER.
6. CONTRACTOR SHALL ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, TREES, SHRUBS, OTHER PERMANENT OBJECTS AND ADJOINING PROPERTY.
7. NO OPEN EXCAVATIONS SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED, AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AREAS; 3/4 INCH PLYWOOD, WOOD PLANKING WITH OSHA ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS, OR AS APPROVED BY THE CITY OF FRIENDSWOOD.
8. EXISTING PAVEMENTS, CURBS, SIDEWALKS AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION BY THE CONTRACTOR FOR THEIR CONVENIENCE SHALL BE REPLACED PER CURRENT TECHNICAL SPECIFICATIONS BY THE CONTRACTOR AT THEIR EXPENSE.
9. CONTRACTOR SHALL PLAN, SCHEDULE, AND PERFORM THEIR WORK SO AS TO PROVIDE AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS NON-INCONVENIENCE TO ALL PROPERTY OWNERS ALONG THE PROJECT RIGHT OF WAYS DURING CONSTRUCTION PERIOD.
10. FOR LOCATIONS WHERE OPEN CUT CONSTRUCTION IS REQUIRED IN STREETS THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE BARRICADES, WARNING AND DIRECTING SIGNS, FLAGS, AND LIGHTS, NOTIFY CITY OF FRIENDSWOOD PROJECT MANAGER (281-996-3201).
11. ALL SIGNS, BARRICADES, PAVEMENT MARKINGS, TRAFFIC SIGNALS, AND CHANNELIZING DEVICES USED TO HANDLE TRAFFIC SHALL BE SHOWN ON A TRAFFIC CONTROL PLAN (TO BE APPROVED BY THE CITY OF FRIENDSWOOD) AND SHALL CONFORM TO THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), "PART VI-TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS."
12. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD PROJECT MANAGER (281-996-3201) AND PUBLIC WORKS (281-996-3380) 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

PAVING:

1. PAVEMENT SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISIONS.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD AT (281-996-3201), TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL RETURNS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.
5. ALL FILL IN EXISTING OR PROPOSED RIGHTS-OF WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF EIGHT (8) INCHES OR LESS AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE SIXTY (60), NO. FOUR (4) REBAR, SPACED AT SIXTEEN (16) INCH ON CENTERS EACH WAY.
7. ALL PAVEMENT TO BE A MINIMUM OF SIX (6) INCHES THICK REINFORCED CONCRETE UNLESS OTHERWISE NOTED.
8. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF SIXTY (60) FEET.
9. ALL CONCRETE USED FOR PAVEMENT SHALL BE CLASS "A" CONCRETE WITH A MINIMUM 5.0 SACK OF CEMENT PER CUBIC YARDS AND A MINIMUM 3,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS, UNLESS OTHERWISE NOTED.
10. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF SIX PERCENT (6%).
11. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
12. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
13. FOR ALL CONCRETE TO BE REMOVED, A TWO (2) INCH DEEP SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
14. REPRESENTATIVES FROM THE CITY OF FRIENDSWOOD , THE OWNER AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL DENSITY TESTS, LIME OPERATIONS AND PLACEMENT OF CONCRETE PAVING.
15. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TEST AND/OR CONCRETE CYLINDERS HAVE BEEN TAKEN.
16. BLUE REFLECTORIZED PAVEMENT MARKERS SHALL BE PLACED AT FIRE HYDRANT LOCATIONS AND OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY. REFLECTORS SHALL FACE FLOW OF TRAFFIC.
17. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET B/B OF CURB:
  - 17.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
  - 17.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.
18. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET B/B OF CURB AND ALL MAJOR ARTERIAL THOROUGHFARES:
  - 18.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
  - 18.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.
19. BLOCKOUTS SHALL BE INSTALLED AROUND ALL MANHOLES, JUNCTION BOXES, WATER VALVES, ETC. THAT LIE WITHIN THE PAVEMENT AREA. BLOCKOUTS SHALL EXTEND A MINIMUM OF SIX (6) INCHES PAST THE LARGEST DIMENSION OF THE ITEM THAT IS BEING BLOCKED OUT AND SHALL HAVE AN EXPANSION JOINT BETWEEN THE BLOCKOUT AND THE PAVING.

SANITARY SEWERS

1. FINISHED ELEVATION ON SANITARY MANHOLE RIMS SHALL BE THREE (3) INCHES ABOVE FINISHED GRADE WITHIN THE UTILITY EASEMENT. IF MANHOLE IS LOCATED ADJACENT TO A PUBLIC STREET, THE FINAL ELEVATION OF THE MANHOLE RIM SHALL BE TWO (2) INCHES ABOVE THE CURB OR CENTERLINE OF STREET FOR STREETS WITHOUT PERIMETER CURB.
2. WATER LINES AND SANITARY SEWERS SHALL BE INSTALLED IN SEPARATE TRENCHES AND BE A MINIMUM SEPARATION OF NINE (9) FEET.
3. POLYVINYL CHLORIDE (PVC) SHALL BE IN ACCORDANCE WITH ASTM D3034, SDR 26 FOR ALL DEPTHS.
4. ALL PVC PIPES (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE A RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477, SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SANITARY SEWER LINES.
5. ALL DUCTILE IRON (DI) PIPE SHALL BE 150 PSI WITH EIGHT (8) MIL, BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI/AWWA A21.5/C105.
6. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICVAL SPECIFICATIONS, LATEST REVISION. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS. ALL SANITARY SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. SANITARY SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT ARE TO BE BACKFILLED WITH CEMENT-STABILIZED SAND BACKFILL, AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE. BEDDING WILL BE CEMENT-STABILIZED SAND BACKFILL (1.1 SACKS CEMENT PER TON OF SAND) FOR ALL SANITARY SEWERS.
8. WATER LINE/NEW SEWER LINE SEPARATION. WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO WATER LINES THAN NINE (9) FEET IN ALL DIRECTIONS. SEWERS THAT PARALLEL TO WATER LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHEN NINE (9) FEET OF SEPARATION CANNOT BE MAINTAINED, THE FOLLOWING GUIDELINES APPLY:
  - 8.1. WHEN THE SANITARY SEWER PARALLELS A WATER LINE, THE SANITARY SEWER SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO (2) FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR (4) FEET BETWEEN OUTSIDE DIAMETERS. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE.
  - 8.2. WHEN A SANITARY SEWER CROSSES A WATER LINE AND THE SEWER IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI; AN ABSOLUTE MINIMUM OF SIX (6) INCHES BETWEEN OUTSIDE DIAMETERS SHALL BE MAINTAINED. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE WHEN POSSIBLE AND ONE (1) LENGTH OF THE SANITARY SEWER PIPE MUST BE CENTERED ON THE WATER LINE.
  - 8.3. WHEN A SANITARY SEWER CROSSES UNDER A WATER LINE AND THE SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIPE WITH GASKETED JOINTS, A MINIMUM OF TWO (2) FEET OF SEPARATION SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT-STABILIZED SAND (MINIMUM 1.1 SACKS OF CONCRETE PER TON OF SAND) FOR ALL SECTIONS OF SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE. THE INITIAL BACKFILL SHALL BE FROM ¼ DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE PIPE DIAMETER (BUT NOT LESS THAN TWELVE (12) INCHES) ABOVE THE PIPE.
  - 8.4. WHEN A SANITARY SEWER CROSSES OVER A WATER LINE, ALL PORTIONS OF THE SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. IN LIEU OF THIS PROCEDURE THE NEW SANITARY SEWER MAY BE ENCASED IN A JOINT OF 150 PSI PRESSURE CLASS PIPE AT LEAST EIGHTEEN (18) FEET LONG AND TWO (2) NOMINAL SIZES LARGER THAN THE NEW SANITARY SEWER. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT INTERVALS OF FIVE (5) FEET WITH SPACERS OR BE FILLED TO THE SPRINGLINE WITH WASHED SAND. THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH NON-SHRINK CEMENT GROUT OR WITH A MANUFACTURED SEAL.
9. ALL PROPOSED SANITARY SEWER LINES SHALL BE DUCTILE IRON OR SDR 26 PVC. DUCTILE IRON PIPE SHALL ONLY BE USED AS APPROVED BY THE CITY OF FRIENDSWOOD.
10. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS.

SANITARY SEWERS (CONT.)

11. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED. ALL SANITARY SEWER MANHOLES SHALL BE AT LEAST THREE (3) INCHES ABOVE FINISHED GRADE OR ABOVE 100-YEAR BASE FLOOD ELEVATION (BFE). FOR MANHOLES LOCATED IN THE 100-YEAR FLOOD PLAIN, VENT AND SEAL (BOLTED MANHOLE LID WITH FOUR (4) BOLTS, NO HOLES IN THE LID) THE MANHOLE TOP AND PROVIDE INFLOW PROTECTION INSERT UNDER COVER. SECTIONS OF PRECAST MANHOLES SHALL BE JOINED WITH "RAM-NEK" IN FLOOD PLAIN.
12. SANITARY SEWER LINE IN PIPE ZONE INSIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND OR SELECT FILL MATERIAL WITH A PI BETWEEN 20 AND 40.
13. IF WET SAND IS ENCOUNTERED IN TRENCH, USE SPECIAL BEDDING.
14. SANITARY SEWERS CROSSING UTILITIES OTHER THAN WATER LINES SHALL HAVE A MINIMUM CLEARANCE OF SIX (6) INCHES.
15. ALL PRECAST MANHOLES SHALL HAVE THE TOP ADJUSTMENT CONSTRUCTED OF PRECAST PCC RINGS NO GREATER THAN TWENTY-FOUR (24) INCHES IN HEIGHT, SEALED WITH NON-SHRINK GROUT INSIDE AND OUT. BRICK MANHOLES SHALL NOT BE ALLOWED.
16. ALL SANITARY SEWER MANHOLE COVERS MUST INCLUDE THE WORDS "SANITARY SEWER" AND "CITY OF FRIENDSWOOD". THEY MUST ALSO HAVE THE CITY SEAL.
17. SANITARY SEWER MANHOLE COVERS SHALL BE A MINIMUM OF THIRTY-TWO (32) INCHES IN DIAMETER.
18. ALL SANITARY SEWER MANHOLES SHALL HAVE AN INFLOW PROTECTOR.

STORM SEWERS:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT TWENTY-EIGHT (28) DAYS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE AFTER PAVING IS COMPLETE.
6. MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM UPSTREAM ROADSIDE DITCH CULVERT SIZE IS EIGHTEEN (18) INCH DIAMETER.
7. ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS, "STORM SEWER" AND "CITY OF FRIENDSWOOD" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.
9. ALL INLETS IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDROMULCHED AS PER TECHNICAL SPECIFICATIONS SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.

WATER LINES:

1. WATER LINE CONSTRUCTION AND TESTING IS TO BE PERFORMED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS, LATEST REVISION.
2. ALL WATER MAINS SHALL HAVE A MINIMUM COVER OF FOUR (4) FEET MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED.
3. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 150 PSI FOR FOUR (4) HOURS AND WITNESSED BY THE CITY OF FRIENDSWOOD PROJECT MANAGER, EXCEPT FIRE LINES WHICH SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHAL.
4. SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S. POLYETHYLENE, SDR-9.
5. CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISH GRADE.
6. FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS.
7. WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C-500, OPEN COUNTER CLOCKWISE (LEFT), EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT. OPERATING NUT SHALL BE A MAXIMUM OF FIVE (5) FEET BELOW FINISH GRADE.
8. WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY THE REQUIREMENTS OF AWWA STANDARD C-900-75, CLASS 150, SDR-18, WITH CAST IRON OUTSIDE DIAMETER AND GASKET BELL END. FITTINGS ARE TO BE MECHANICAL JOINTS IN ACCORDANCE WITH AWWA C-100 OR C-110.
9. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL BE CLASS "C" AND HAVE A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND CONFORM TO CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
10. DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C-110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C-110 AND END JOINTS TO FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C-111 FOR RUBBER GASKETED JOINTS. DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
11. MINIMUM BURY FOR ALL FIRE HYDRANTS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE. PUMPER SERVICE CONNECTION TO FACE CURB.
12. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
13. CONTRACTOR SHALL NOTIFY CITY OF FRIENDSWOOD PROJECT MANAGER SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.
14. ALL WATER LINES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. FOR PORTIONS OF PIPE LOCATED UNDER PAVEMENT, BACKFILL FROM INITIAL BACKFILL OF BANK SAND TO ONE (1) FOOT BELOW PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT-STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).
15. ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB, ONE (1) FOOT FROM PROPERTY LINE FOR STREETS WITH DITCHES OR AT AN APPROVED LOCATION ON RURAL SECTION ROADS. ALL FIRE HYDRANTS SHALL BE AUDITED, SANDBLASTED AND PAINTED AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS, LATEST REVISION.
16. ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.
17. THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY PROJECT MANAGER AND CONTACT THE PUBLIC WORKS DEPARTMENT TWENTY-FOUR (24) HOURS MINIMUM, BY FAXING DOCUMENT 01740 – UTILITY DIVISION ASSISTANCE REQUEST TO (281-482-1083), FOR ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING RESULTS IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES TWENTY-FOUR (24) HOURS IN ADVANCE OF THE INTERRUPTION.
18. FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY AT THE PUBLIC WORKS DEPARTMENT AT 1306 DEEPWOOD DRIVE (281-996-3382). A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.

TESTING:

ALL TESTING SHALL CONFORM WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS SECTION 01470 – TESTING LABORATORY SERVICES AND SECTION 01475 – TESTING PROCEDURES

1. SECTION 02125 – EXCAVATION AND BACKFILL FOR UTILITIES:
  - 1.1. BACKFILL SHALL BE PLACED IN MAXIMUM LIFTS OF EIGHT (8) INCHES AND COMPACTED TO A DENSITY OF NOT LESS THAN 95% STANDARD PROCTOR WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE OR AS OTHERWISE SPECIFIED BY THE SOILS LABORATORY. TEST SHALL BE TAKEN EVERY LIFT, EVERY 500 LINEAR FEET, OR BETWEEN MANHOLES, WHICHEVER RESULTS IN THE GREATEST NUMBER OF DENSITY TESTS.
  - 1.2. FIELD MOISTURE/DENSITY TEST SHALL BE PERFORMED AT A FREQUENCY OF AT LEAST ONE (1) TEST PER 500 SQUARE YARDS OF COMPACTED LIFT. THE DENSITY SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE, OR AS DETERMINED BY SOILS LABORATORY. MAXIMUM LIFT FOR TESTING COMPACTED FILL SHALL NOT EXCEED TWELVE (12) INCHES.

TESTING (CONT.)

2. SECTION 02300 – CAST-IN-PLACE CONCRETE MANHOLES AND SECTION 02305 – PRECAST CONCRETE MANHOLES:
  - 2.1. EXFILTRATION TEST SHALL BE REQUIRED FOR EACH MANHOLE SYSTEM.
    - 2.1.1. EACH MANHOLE IS TO BE PLUGGED, FILLED TO THE TOP OF THE RIM WITH WATER FOR THIRTY (30) MINUTES WITH THE ALLOWABLE LEAKAGE OF NOT MORE THAT ½".
    - 2.1.2. PLUG MANHOLE AND VACUUM TEST AT TEN (10) INCHES OF MERCURY WITH A LOSS OF NO MORE THAN ONE (1) INCH OF MERCURY FOR THE TIME TO BE DETERMINED BY THE WIDTH AND DEPTH OF THE MANHOLE.
3. SECTION 02400 – WATER LINES
  - 3.1. PRESSURE TEST:
    - 3.1.1. A TEST, TO BE SUCCESSFUL SHALL BE WITNESSED BY THE CITY OF FRIENDSWOOD PROJECT MANAGER FOR A FOUR (4) HOUR PERIOD, DURING REASONABLE HOURS. THE ALLOWABLE LEAKAGE SHALL BE NO GREATER THAN DETERMINED BY THE FOLLOWING FORMULA:

      $L = NDP^{2} / 7400$

      IN WHICH L IS THE ALLOWABLE LEAKAGE IN GALLONS PER HOUR OF TESTING, N IS THE NUMBER OF JOINTS IN THE LENGTH OF PIPE BEING TESTED, D IS THE NOMINAL INSIDE DIAMETER OF THE PIPE IN INCHES, AND P IS THE AVERAGE TEST PRESSURE DURING THIS TEST IN POUNDS PER SQUARE INCH. THE TEST PRESSURE SHALL BE 150 PSI FOR FOUR (4) HOURS. ALL VALVES, FIRE HYDRANTS, AND SERVICES ARE TO BE TESTED TOGETHER.
    - 3.1.2 FIRE LINES SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHAL. LEAKAGE SHALL BE CALCULATED AS STATED ABOVE.
  - 3.2. BACTERIAL TEST (BAC-T)
    - 3.2.1. BACTERIAL SAMPLE IS REQUIRED FOR EACH 1,000 FEET OF WATER MAIN, OR CLOSER DEPENDING ON FIRE HYDRANT LOCATIONS, OR PORTION THEREOF. ALSO DEAD ENDS ARE SUBJECT TO TESTING, SUCH AS CUL-DE-SAC. THE FORM NEEDS TO BE LABELED "CONSTRUCTION" OR "SPECIAL." BOTH FORM AND SAMPLE ARE TESTED AT A LABORATORY APPROVED BY TCEQ. PAYMENT SHALL BE EXPECTED AT TIME OF SAMPLING. SAMPLINGS SHALL ONLY BE CONDUCTED ON TUESDAYS AND THURSDAYS WITH FORTY-EIGHT (48) HOUR NOTIFICATION GIVEN IN THE FORM OF DOCUMENT 01740 – UTILITY DIVISION ASSISTANCE FAXED TO 281-482-1083.
4. SECTION 02500 – GRAVITY SANITARY SEWERS:
  - 4.1. LOW PRESSURE AIR TEST – THE PIPE SHALL UNDERGO A LOW PRESSURE AIR TEST WHICH SHALL CONFORM TO ASTM C828 AND ASTM C494. THE PRESSURE SHALL BE FIVE (5) PSI FOR A DURATION AS DETERMINED BY THE LENGTH AND NOMINAL I.D. OF THE PIPE BEING TESTED.
  - 4.2. MANDREL DEFLECTION TEST – FLEXIBLE AND SEMI-RIGID PIPE DIAMETER DEFLECTION TEST SHALL BE DONE NO SOONER THAN THIRTY (30) DAYS AFTER FINAL BACKFILL. RUN TEST WITH A MANDREL HAVING A DIAMETER EQUAL TO 95% OF THE INSIDE NOMINAL DIAMETER OF THE PIPE BEING TESTED. MANDREL SHALL BE NINE (9) ARM WITH STEEL PROVING RING 2½ INCH RING WIDTH. TO PASS, MANDREL SHALL PASS FREELY THROUGH THE PIPE, PULLED BY ONE (1) WORKER. NO MECHANICAL MEANS SHALL BE ALLOWED TO PULL THE MANDREL.
  - 4.3. FORCE MAIN TEST – FORCE MAINS SHALL BE TESTED IN THE SAME MANNER AS WATER MAINS ACCORDING TO PARAGRAPH 3.1.1.
5. SECTION 02720 – LIME-STABILIZED SUBGRADE:
  - 5.1. LIME
    - 5.1.1 PERCENT LIME DETERMINATION TEST SHALL BE TAKEN BY A CERTIFIED TESTING LABORATORY IN ACCORDANCE WITH ASTM C977-92, BUT SHALL NOT BE LESS THAN 6%.
    - 5.1.1. THE PERCENT LIME USED SHALL BRING THE SOIL TO A P.I. OF NOT MORE THAN 15.
    - 5.1.2. HYDRATED LIME SHALL BE SAMPLED AND TAKEN AT THE DISTRIBUTION AREA OF THE TANKER TRUCK AND TESTED.
  - 5.2. SUBGRADE
    - 5.2.1. ALL SUBGRADE SHALL MEET THE FOLLOWING REQUIREMENTS WHEN TEST DRY BY LABORATORY SIEVES:

      MINIMUM PASSING 1¾ INCH SIEVE – 100%
      MINIMUM PASSING ¾ INCH SIEVE – 85%
      MINIMUM PASSING #4 SIEVE – 60%
    - 5.2.2. ALL SUBGRADE SHALL PASS A DENSITY TEST OF NOT LESS THAN 95% STANDARD PROCTOR. METHOD OF TESTING AS PER ASTM D698. TEST TO BE TAKEN EVERY 200 FEET AS MEASURED ALONG CENTERLINE OF THE ROADWAY AT VARYING DISTANCES FROM CENTERLINE OF THE ROADWAY, OR AS DIRECTED BY THE CITY OF FRIENDSWOOD.
    - 5.2.3. THICKNESS TESTS SHALL BE TAKEN AT EVERY 200 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.
    - 5.2.4. IF A SINGLE STORM EVENT PRODUCES ONE (1) INCH OR MORE OF RAINFALL, CONTRACTOR SHALL RE-TEST THE SUBGRADE FOR DENSITY. THE INTERVAL FOR DENSITY RE-TESTS SHALL BE NOT LESS THAN 500 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.
6. SECTION 02805 – CONCRETE PAVING:
  - 6.1. THE CONCRETE PAVEMENT WILL BE CORE DRILLED EACH 1,000 SQUARE YARDS OR FOR EACH STREET, WHICHEVER IS GREATER, AND WILL BE TESTED FOR DEPTHS IN ACCORDANCE WITH ASTM C174 TEST OR OTHER APPROVED TESTING METHOD. THICKNESS SHALL NOT BE DEFICIENT BY MORE THAN ¼ INCH. THE CORE SHALL ALSO BE TESTED FOR COMPRESSIVE STRENGTH.
7. SECTION 03300 – STRUCTURAL CONCRETE:
  - 7.1. THE SLUMP, WHEN PLACING CONCRETE, SHALL NOT BE GREATER THAN FIVE (5) INCHES. THIS TEST SHALL BE TAKEN FOR EVERY FIFTY (50) CUBIC YARDS OF CONCRETE, BUT MAY BE TAKEN WHEN IN DOUBT BY THE TESTING LABORATORY TECHNICIAN OR THE CITY OF FRIENDSWOOD PROJECT MANAGER.
  - 7.2. TEMPERATURE OF THE CONCRETE WILL BE TAKEN AS DIRECTED BY THE CITY OF FRIENDSWOOD PROJECT MANAGER AND SHALL BE LESS THAN 90° F.
  - 7.3. THERE SHALL BE CYLINDERS TAKEN BY THE TESTING LABORATORY TECHNICIAN NUMBERING FOUR (4) CYLINDERS PER 100 CUBIC YARDS OF PAVING OR PART THEREOF FOR EACH DAYS PLACEMENT. TWO (2) CYLINDERS SHALL BE TESTED AT SEVEN (7) DAYS AND TWO (2) CYLINDERS SHALL BE TESTED AT TWENTY-EIGHT (28) DAYS WITH A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI IN TWENTY-EIGHT (28) DAYS IN ACCORDANCE WITH ASTM C31 TEST.

PRIVATE UTILITY NOTES

CAUTION: AT&T CABLES

THE LOCATION OF AT&T FACILITIES ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF AT&T FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING THE CONTRACTOR SHALL EXPOSE THE AT&T FACILITIES.

WHEN AT&T TELEPHONE FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

CAUTION: UNDERGROUND GAS FACILITIES

LOCATIONS OF CENTERPOINT ENERGY MAIN LINES (TO INCLUDE UNIT GAS TRANSMISSION AND/OR INDUSTRIAL GAS SUPPLY CORPORATION WHERE APPLICABLE) ARE SHOWN IN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. OUR SIGNATURE ON THESE PLANS ONLY INDICATES THAT OUR FACILITIES ARE SHOWN IN APPROXIMATE LOCATION. IT DOES NOT IMPLY THAT A CONFLICT ANALYSIS HAS BEEN MADE. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 713-223-4567 OR 1-800-669-8344 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE CALL 713-967-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF THE INDICATED LOCATION OF CENTER ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

CAUTION: UNDERGROUND GAS FACILITIES (CONT.)

WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

CAUTION: OVERHEAD POWER LINES

TEXAS LAW ARTICLE 1436C, PROHIBITS ALL ACTIVITIES IN WHICH PERSONS OF EQUIPMENT MAY COME WITHIN SIX (6) FEET OF ENERGIZED OVERHEAD POWER LINES, AND FEDERAL REGULATIONS, TITLE 29, PART 1910.180 (1) AND PART 1926.550 (A)(15) REQUIRE A MINIMUM CLEARANCE OF TEN (10) FEET FROM THESE FACILITIES. THE ABOVE LAWS CARRY BOTH CRIMINAL AND CIVIL LIABILITIES. IF THE CONTRACTOR PERFORMS ANY WORK NEAR OVERHEAD POWER LINES HE MUST CALL 281-996-0453 FOR THE LINES TO BE DE-ENERGIZED AND/OR MOVED AT HIS EXPENSE PRIOR TO PERFORMING THE WORK.

NOTE:
LOCATION OF TEXAS-NEW MEXICO POWER COMPANY FACILITIES ARE APPROXIMATE AND HAVE NOT BEEN VERIFIED BY ACTUAL FIELD CHECK.

OVERHEAD LINES MAY EXIST ON THE PROPERTY. WE HAVE NOT ATTEMPTED TO MARK THOSE LINES SINCE THEY ARE CLEARLY VISIBLE, BUT CONTRACTOR SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE, FORBIDS ALL ACTIVITIES WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES. CONTRACTORS ARE LEGALLY RESPONSIBLE FOR SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL TEXAS-NEW MEXICO POWER COMPANY AT 281-996-0453.

CONTRACTOR TO NOTIFY THE "UNDERGROUND UTILITY COORDINATING COMMITTEE" TELEPHONE 713-223-4567 FORTY-EIGHT (48) HOURS BEFORE STARTING WORK IN STREET RIGHTS-OF-WAY OR EASEMENTS.

GENERAL CONSTRUCTION NOTES

FILE NAME: GENERAL CONSTRUCTION NOTES 2009.DWG

DATE APPROVED: OCTOBER 2010

SCALE: NTS | REVISED DATE: AUGUST 2010

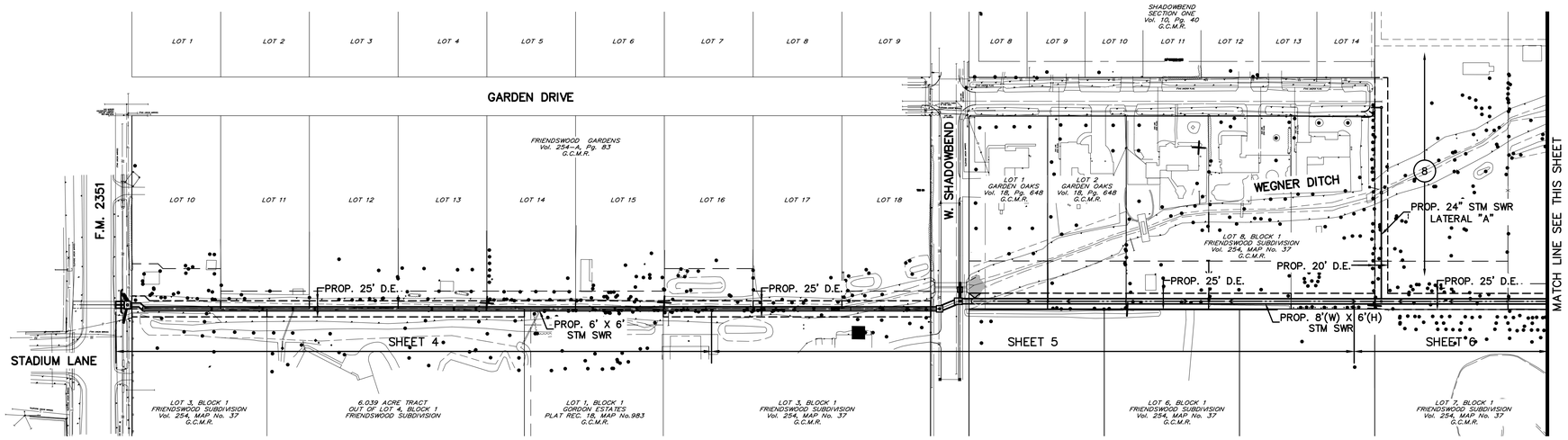
FRIENDSWOOD TEXAS

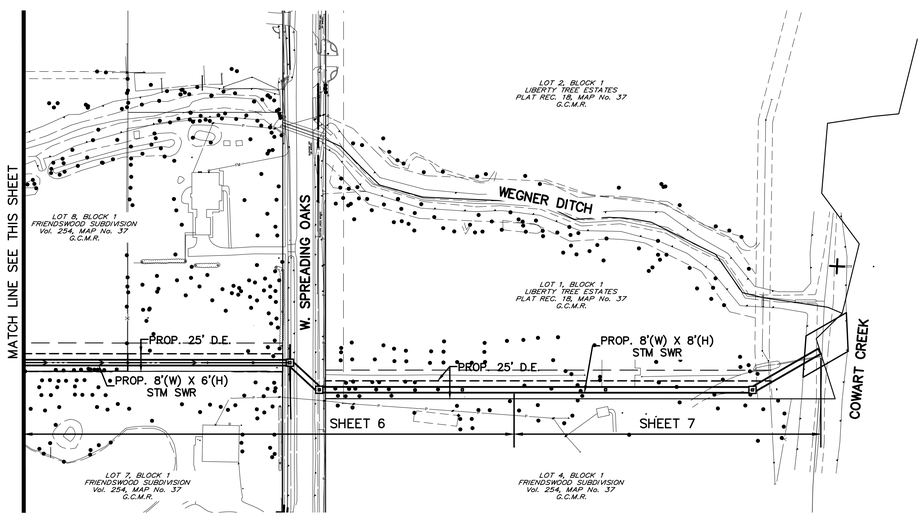
COMMUNITY DEVELOPMENT DEPARTMENT

PROJECT NUMBER: LE-13092

DATE SUBMITTED:

SHEET: 2 OF 21





MISCELLANEOUS NOTES

1. CONTRACTOR TO PROVIDE ALL PIPE WORK EXCAVATION AND BACKFILL, STRUCTURAL FOUNDATION EXCAVATION AND/OR FILL, ACCESS ROAD EXCAVATION AND/ OR FILL, AND ALL FINISHED GRADING AND SEEDING TO THE FINISHED ELEVATIONS SHOWN, INCLUDING REQUIRED COMPACTION WORK AND DISPOSAL OF ALL EXCESS EXCAVATED MATERIALS.
2. EXISTING PAVEMENTS, CURBS, SIDEWALKS, AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO CITY OF FRIENDSWOOD STANDARDS.
3. UNDERGROUND UTILITIES MAY EXIST IN THE VICINITY OF THIS PROJECT. LOCATIONS SHOWN FOR EXISTING UTILITIES ARE APPROXIMATE AND OTHER UTILITIES MAY EXIST IN THE VICINITY OF THE PROJECT WHICH ARE NOT SHOWN ON THE PLANS.
4. THE CONTRACTOR SHALL BE LIABLE FOR ALL LEGAL ACTIONS RESULTING FROM CONSTRUCTION ACTIVITY IN THIS PROJECT AND BY ACCEPTING THESE PLANS, AGREES TO HOLD THE OWNER AND ENGINEER HARMLESS FROM ANY CLAIMS OR DAMAGES RESULTING FROM THIS WORK.
5. THE CONTRACTOR SHALL PLAN, SCHEDULE AND PERFORM HIS WORK TO PROVIDE FOR AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS CONVENIENCE TO ALL PROPERTY OWNERS AND BUSINESS ESTABLISHMENTS ALONG THE PROJECT RIGHT-OF-WAY DURING THE CONSTRUCTION PERIOD.
6. THE CONTRACTOR SHALL PROTECT ALL EXISTING FENCES AND TREES THAT ARE NOT TO BE REMOVED OR RELOCATED.
7. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD, 48 HOURS BEFORE STARTING WORK ON THIS PROJECT. STARTING WORK ON THIS PROJECT.
8. CONTRACTOR SHALL OBTAIN ALL APPLICABLE PERMITS.

GENERAL NOTES:

1. UTILITIES ARE LOCATED IN AN APPROXIMATE MANNER ONLY. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY ENGINEER AND CITY OF PEARLAND ENGINEERING PROJECT OF ANY DISCREPANCIES.
2. CONTRACTOR TO CONTACT THE UTILITY COORDINATING COMMITTEE FOR LOCATION OF EXISTING FACILITIES THAT MAY NOT BE SHOWN ON THE PLANS 24 HOURS PRIOR TO BEGINNING CONSTRUCTION (PHONE 713-223-4567 OR 1-800-669-8344).
3. CONTRACTOR TO OBTAIN ALL PERMITS REQUIRED BY THE CITY OF FRIENDSWOOD FOR CONSTRUCTION WITHIN ROAD RIGHT-OF-WAY.
4. CONTRACTOR TO FOLLOW CONSTRUCTION DETAILS IF DRAWINGS DEVIATE FROM CITY OF FRIENDSWOOD STANDARDS.
5. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE TO THE EXISTING PUBLIC OR PRIVATE UTILITY LINES, INCLUDING BUT NOT LIMITED TO WATER LINES, WASTEWATER COLLECTION SYSTEMS, AND STORM SEWERS DURING CONSTRUCTION. ALL DAMAGES SHALL BE REPAIRED IN ACCORDANCE WITH CITY OF FRIENDSWOOD, SPECIFICATIONS WITH NO COST TO THE PUBLIC.
6. THESE DRAWINGS DEPICT THE FINAL CONSTRUCTED CONFIGURATION. NEITHER CONSTRUCTION MEANS AND METHODS NOR CONSTRUCTION SAFETY ARE PART OF THE ENGINEER'S EXPERTISE OR SCOPE OF WORK. THE GENERAL CONTRACTOR AND HIS SUBCONTRACTORS ARE FULLY RESPONSIBLE FOR THE MEANS AND METHODS USED TO CONSTRUCT THE STRUCTURE AND FOR FULL COMPLIANCE WITH ALL JOB SAFETY RELATED REGULATIONS AND CONDITIONS AT THE SITE. LIMITED SITE VISITS IF ANY BY THE ENGINEER ARE SOLELY TO OBSERVE COMPLETED PARTS OF THE STRUCTURE. THE ENGINEER IS NEITHER QUALIFIED TO OBSERVE NOR COMMENT ON CONSTRUCTION MEANS AND METHODS AND JOB SITE SAFETY.
   ALL DETAILS ARE TYPICAL UNLESS NOTED OTHERWISE. DETAILS SHALL APPLY TO ALL SIMILAR AND LIKE CONDITIONS.
   SHOP DRAWINGS SHALL BE NEW DRAWINGS PRODUCED BY THE CONTRACTOR, ILLEGIBLE REPRODUCTIONS OF THE DESIGN DRAWING WILL BE REJECTED. ELECTRONIC FILES MAY BE PURCHASED FROM THE ENGINEER OF RECORD FOR THE PURPOSE OF PREPARING SHOP DRAWINGS. THE USE OF THE REPRODUCTIONS OF THESE CONTRACT DRAWINGS SIGNIFIES HIS ACCEPTANCE OF ALL INFORMATION SHOWN HEREON AS CORRECT, AND OBLIGATES HIMSELF TO ANY JOB EXPENSE, REAL OR IMPLIED, ARISING DUE TO ANY ERRORS OR OMISSIONS THAT MAY OCCUR HEREON.
7. ALL DISTURBED AREAS IN STREET RIGHTS-OF-WAY OR IN SIDELOT DRAINAGE EASEMENTS SHALL BE SOLID BLOCK SODDED. ALL OTHER DISTURBED AREAS SHALL BE HYDROMULCH SEEDED.
8. ALL TREES, LANDSCAPING OR FENCES DISTURBED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED, RELOCATED, OR REPLACED TO THE OWNER'S SATISFACTION.

EARTHWORK NOTES:

1. ALL EXISTING TOPSOIL SHALL BE REMOVED AND STOCKPILED AND SHALL BE USED FOR THE FINAL 6" OF MATERIAL ON THE DISTURBED AREAS.
2. SITE PREPARATION SHALL CONSIST OF THE REMOVAL OF EXISTING RUBBLE AND/OR VEGETATION AND ORGANIC MATTER AS NECESSARY.
3. SUBGRADE SHALL BE SCARIFIED AND, MOISTURE CONDITIONED, TO A SIX (6) INCH DEPTH, AND THEN RECOMPACTED TO 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR DENSITY TEST (ASTM D698). THE MOISTURE CONTENT SHALL BE BETWEEN OPTIMUM AND +3 PERCENT OF THE OPTIMUM MOISTURE CONTENT. PROVIDE A MINIMUM OF FOUR (4) FIELD DENSITY TESTS PER LIFT OR ONE (1) FOR EVERY 2,500 SQUARE FEET WHICHEVER IS GREATER.
4. FILL SHALL BE PLACE IN EIGHT INCH LOOSE LIFTS AND COMPACTED TO 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR DENSITY TEST (ASTM D698). THE MOISTURE CONTENT SHALL BE BETWEEN OPTIMUM AND +3 PERCENT OF THE OPTIMUM MOISTURE CONTENT FOR SELECT FILL.
5. FILL MATERIAL SHALL BE TESTED DURING PLACEMENT OF EACH LIFT FOR COMPACTION.
6. CONTRACTOR SHALL MAINTAIN A CLEAN EXCAVATION THAT IS FREE OF WATER AND DRAINED 100% OF THE TIME. CONTRACTOR SHALL PROVIDE PUMPS AS REQUIRED TO REMOVE ANY WATER AT ALL TIMES.
7. EXCAVATED MATERIAL FROM THE SITE SHALL BE USED FOR SITE FILL AS REQUIRED. OR DISPOSED OF OFF SITE AT THE CONTRACTOR EXPENSE.
8. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED BY THE CITY OF FRIENDSWOOD.

CONCRETE:

1. ALL CONCRETE REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60, EXCEPT WHERE NOTED. BARS SHALL CONFORM TO ASTM A615, GRADE 40. DEFORMED BAR ANCHORS SHALL CONFORM TO ASTM A496. GR 70.
2. CONCRETE SHALL HAVE SAND AND CRUSHED CARBONATE AGGREGATE CONFORMING TO ASTM C33, TYPE 1 PORTLAND CEMENT, AND THE FOLLOWING DESIGNATED COMPRESSIVE STRENGTH (f'c) IN 28 DAYS:
   SLOPE PAVING 3000 psi
   CONCRETE SUPPLER SHALL BE AWARE OF CEMENTS THAT CAN CAUSE LATE ETTRINGITE FORMATION IN THE CEMENT PASTE AND BE PREPARED TO SHOW THAT THE CEMENTS USED WILL NOT CAUSE THIS PROBLEM.
3. CONCRETE PROTECTION FOR REINFORCEMENT SHALL BE AS FOLLOWS; SEE SEC. 7.7 ACI 318-95 FOR CONDITIONS NOT NOTED. CHAIR REINFORCEMENT TO ADEQUATELY SUPPORT BARS FOR PROPER CLEARANCE AS RECOMMENDED BY THE AMERICAN CONCRETE INSTITUTE AND THE CONCRETE REINFORCING STEEL INSTITUTE. SLAB ONGRADE REINFORCEMENT SHALL BE SUPPORTED AT 45 INCH MAXIMUM INTERVALS OR EVERY THIRD BAR.
   SLOPE PAVING 3 IN. BOT., 2 IN. SIDE, 1 - 1/2 IN. TOP
4. NO HORIZONTAL JOINTS WILL BE PERMITTED IN CONCRETE EXCEPT WHERE THEY NORMALLY OCCUR OR WHERE NOTED. VERTICAL JOINTS SHALL OCCUR AT CENTER SPANS OR AT LOCATIONS APPROVED BY THE ENGINEER.
5. DETAILING OF CONCRETE REINFORCEMENT AND ACCESSORIES SHALL BE IN ACCORDANCE WITH ACI PUBLICATION 315, LATEST EDITION. ALL HOOKED BARS SHOWN IN DETAILS SHALL HAVE STANDARD HOOKS UNLESS NOTED OTHERWISE.
6. REINFORCING BARS SHALL NOT BE WELDED WITHOUT APPROVAL OF THE ENGINEER.
7. UNLESS OTHERWISE NOTED CONTINUOUS BOTTOM REINFORCING BARS SHALL BE SPLICED AT SUPPORTS AND CONTINUOUS TOP REINFORCING BARS SHALL BE SPLICED AT MID-SPAN.
8. ALL CONTINUOUS REINFORCEMENT SHALL LAP 40 BAR DIAMETERS AT SPLICES. PROVIDE 1-#6x 6'-0" TOP AND BOTTOM (TWO 36" LEGS WITH 90 DEGREE BEND) AT EACH FACE OF GRADE BEAMS AT CORNERS AND INTERSECTIONS, AND AT 18" ON CENTER VERTICALLY AT WALLS.
9. ALL MIXING. TRANSPORTING, PLACING AND CURING OF CONCRETE SHALL BE DONE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE AMERICAN CONCRETE INSTITUTE, ACI 301-96.

CONTROL BENCHMARK: ELEV. 29.65
H.G.C.S.D. IRON ROD 54 LOCATED APPROX. 83.4' SOUTHEAST OFF EDGE ROAD (F.M. 528) AND 3' SOUTHWEST OF BACK OF CURB OF CLEAR CREEK DRAINAGE DISTRICT PARKING LOT.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.-S1 ELEV. 25.42
CHISELED SQUARE ON C INLET ON NORTH CORNER OF SUNSET DRIVE AND WEST SPREADING OAKS.
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FLOOD STATEMENT:
AS PER FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP NO. 48546B005E DATED 09-22-99. THE MAJORITY OF THIS SITE IS LOCATED IN ZONE "X" FOR AREAS DETERMINED TO BE OUTSIDE THE 100 YEAR FLOOD PLAIN. THE WORK IN THE IMMEDIATE VICINITY OF COWART CREEK MAY BE IN THE 100-YEAR FLOOD PLAIN AND/OR FLOODWAY.

100 0 100 200
SCALE: 1" = 100'

FRIENDSWOOD TEXAS

MORAD KABIRI, P.E., AICP — DATE
DIRECTOR OF COMMUNITY DEVELOPMENT

KAZ HAMIDIAN — DATE
DIRECTOR OF PUBLIC WORKS

NOTE:
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NO.	DATE	REVISIONS	APP.
1	7/5/16	ACCESS POINT	J.D.A.

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BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net
LENTZ ENGINEERING

COWARD CREEK - TRIBUTARY II
CITY OF FRIENDSWOOD,
GALVESTON COUNTY, TEXAS

GENERAL LAYOUT

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
6/26/17

DRAWN BY: B.S.M.	JOB NO.: LE-13092		
DESIGNED BY: J.D.A.	DATE: JUNE, 2017	SHEET NO.	3
APPROVED BY: J.D.A.	SCALE: 1" = 100'		

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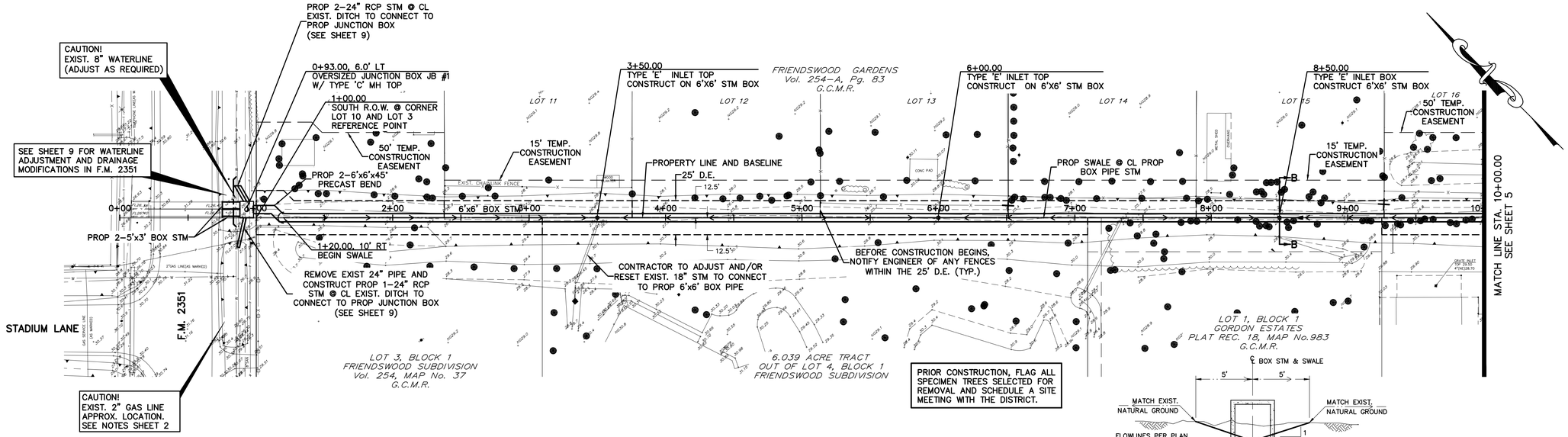

PRIOR CONSTRUCTION, FLAG ALL SPECIMEN TREES SELECTED FOR REMOVAL AND SCHEDULE A SITE MEETING WITH THE DISTRICT.

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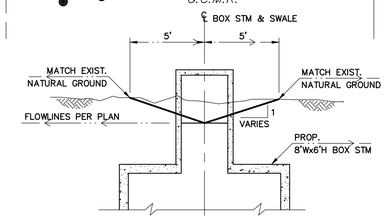
CONSTRUCT SWALE AND VERIFY ADEQUATE DRAINAGE TO CONFIRM GRATE ELEVATIONS PRIOR TO SETTING 'E' INLET TOPS



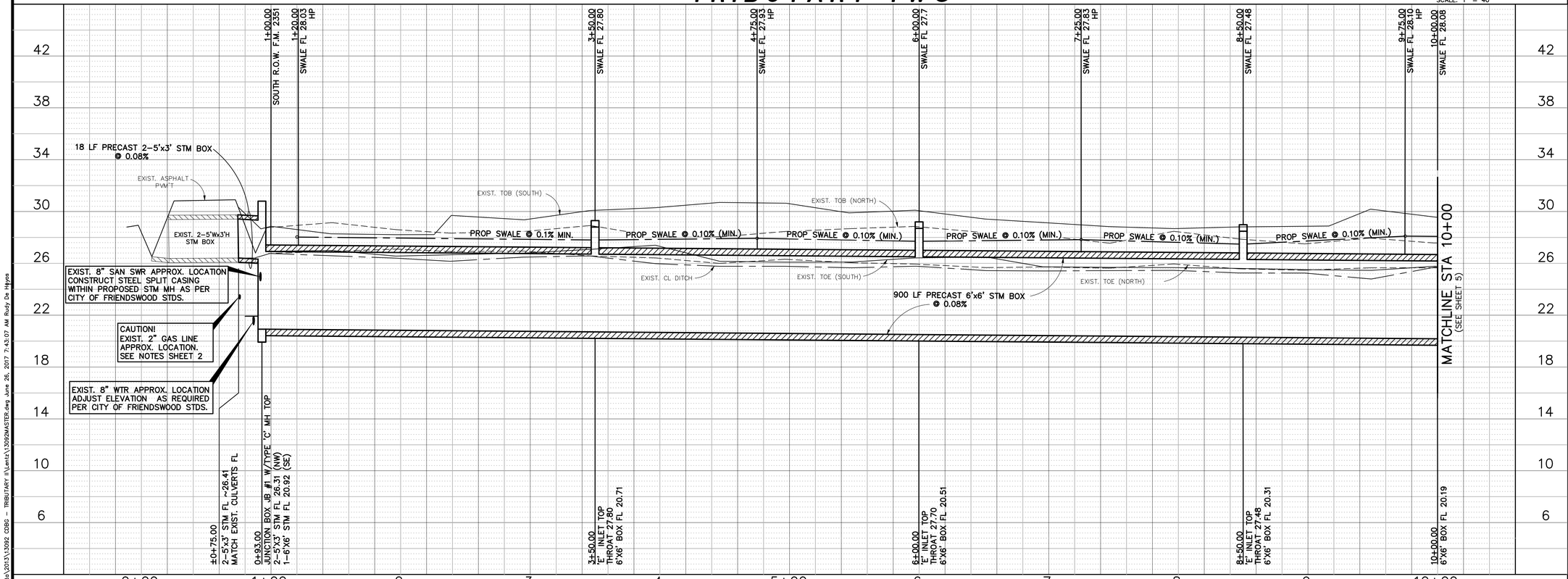
PROPOSED SWALE

TYPICAL SECTION B–B

N.T.S.

SCALE: 1" = 40'

TRIBUTARY TWO



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0+00 TO 10+00

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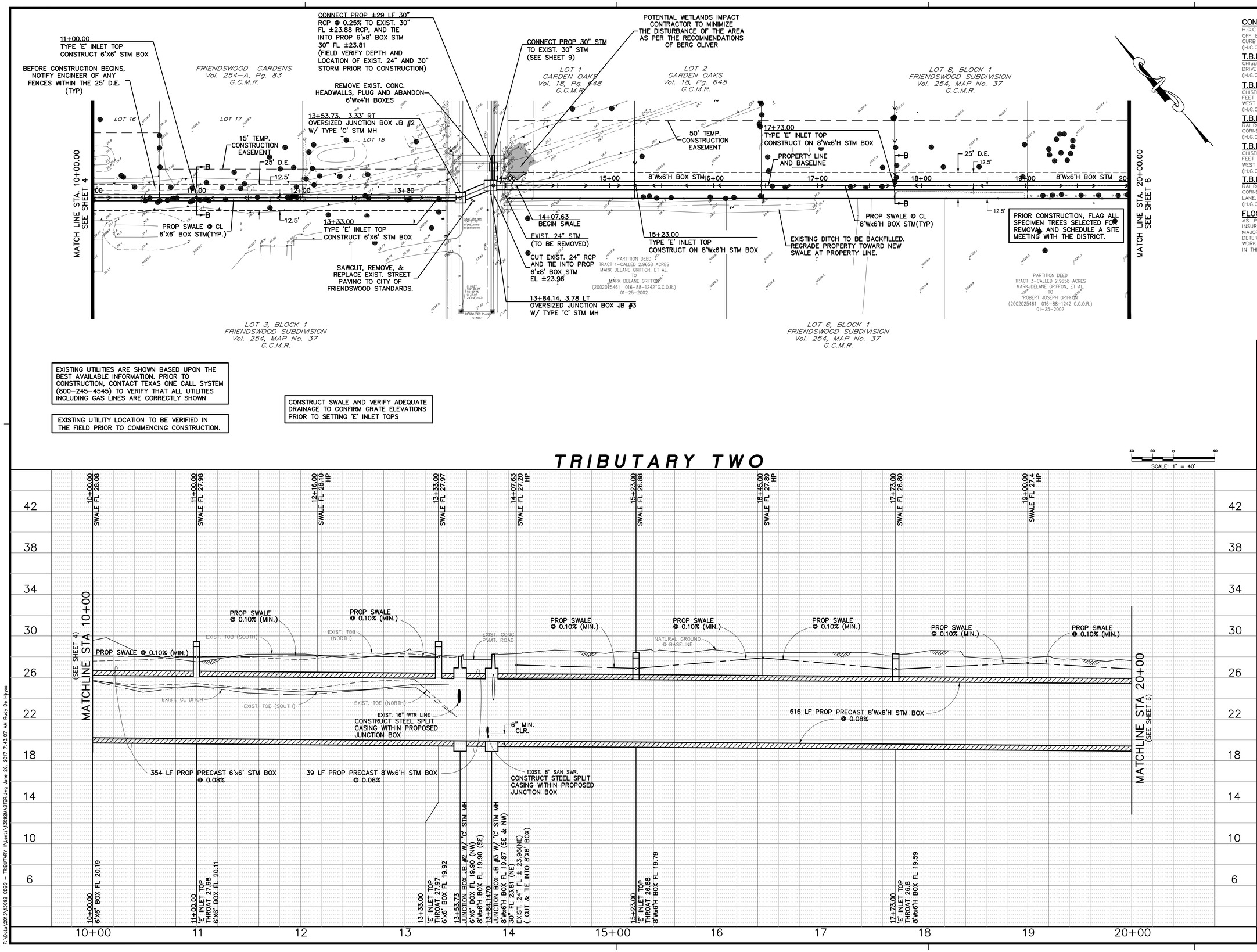

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FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net
LENTZ ENGINEERING

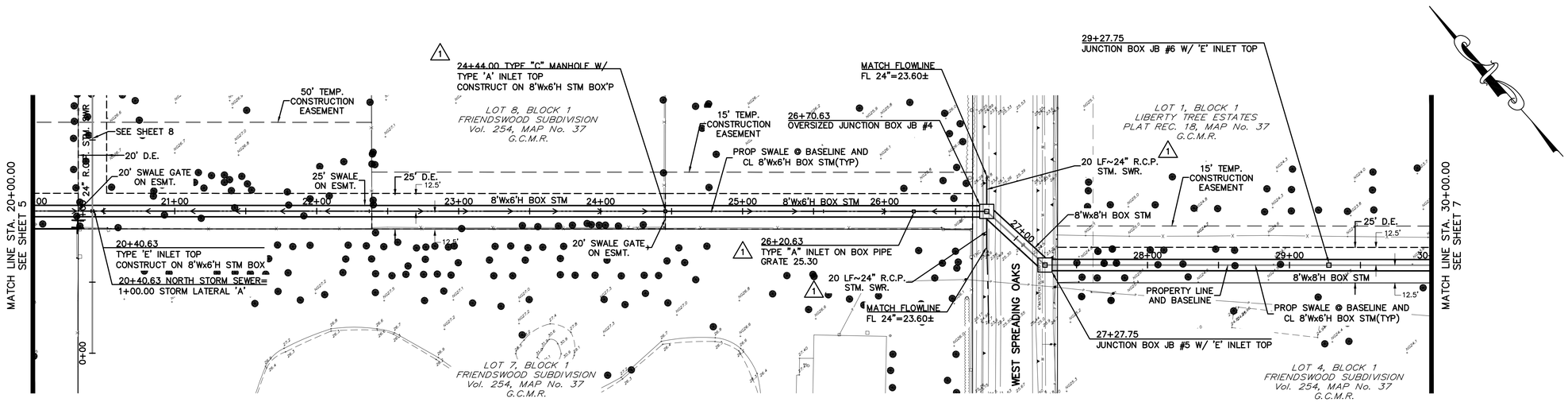
COWARD CREEK - TRIBUTARY II
CITY OF FRIENDSWOOD,
GALVESTON COUNTY, TEXAS

PLAN AND PROFILE STA 10+00 TO 20+00

STATE OF TEXAS — JARROD D. ADEN — 92955 — LICENSED PROFESSIONAL ENGINEER — 12/05/17

DRAWN BY: B.S.M.	JOB No.: LE-13092		
DESIGNED BY: J.D.A.	DATE: JUNE, 2017		
APPROVED BY: J.D.A.	SCALE: 1" = 40'		5

F:\Data\2013\13092 CDBG - TRIBUTARY II\Lentz\13092MASTER.dwg June 26, 2017 7:43:07 AM Rudy De Hypos



CONTROL BENCHMARK: ELEV. 29.65
H.G.C.S.D. IRON ROD 54 LOCATED APPROX. 83.4' SOUTHEAST OFF EDGE ROAD (F.M. 528) AND 3' SOUTHWEST OF BACK OF CURB OF CLEAR CREEK DRAINAGE DISTRICT PARKING LOT.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S1 ELEV. 25.42
CHISELED SQUARE ON C INLET ON NORTH CORNER OF SUNSET DRIVE AND WEST SPREADING OAKS.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S2 ELEV. 27.81
CHISELED SQUARE ON C INLET LOCATED APPROXIMATELY 98 FEET NORTHWEST OF THE INTERSECTION OF SUNSET DRIVE AND WEST SHADOWBEND.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S3 ELEV. 26.40
RAILROAD SPIKE IN ASPHALT LOCATED AT THE NORTHWEST CORNER OF WEST SPREADING OAKS AND SEDORA DRIVE
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CHISELED SQUARE ON C INLET LOCATED APPROXIMATELY 165 FEET SOUTHWEST OF THE INTERSECTION OF GARDEN DRIVE AND WEST SHADOWBEND. (EXACT LOCATION SHOWN ON SURVEY)
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RAILROAD SPIKE IN ASPHALT LOCATED AT THE NORTHWEST CORNER OF THE INTERSECTION OF F.M. 2351 AND STADIUM LANE. (EXACT LOCATION SHOWN ON SURVEY)
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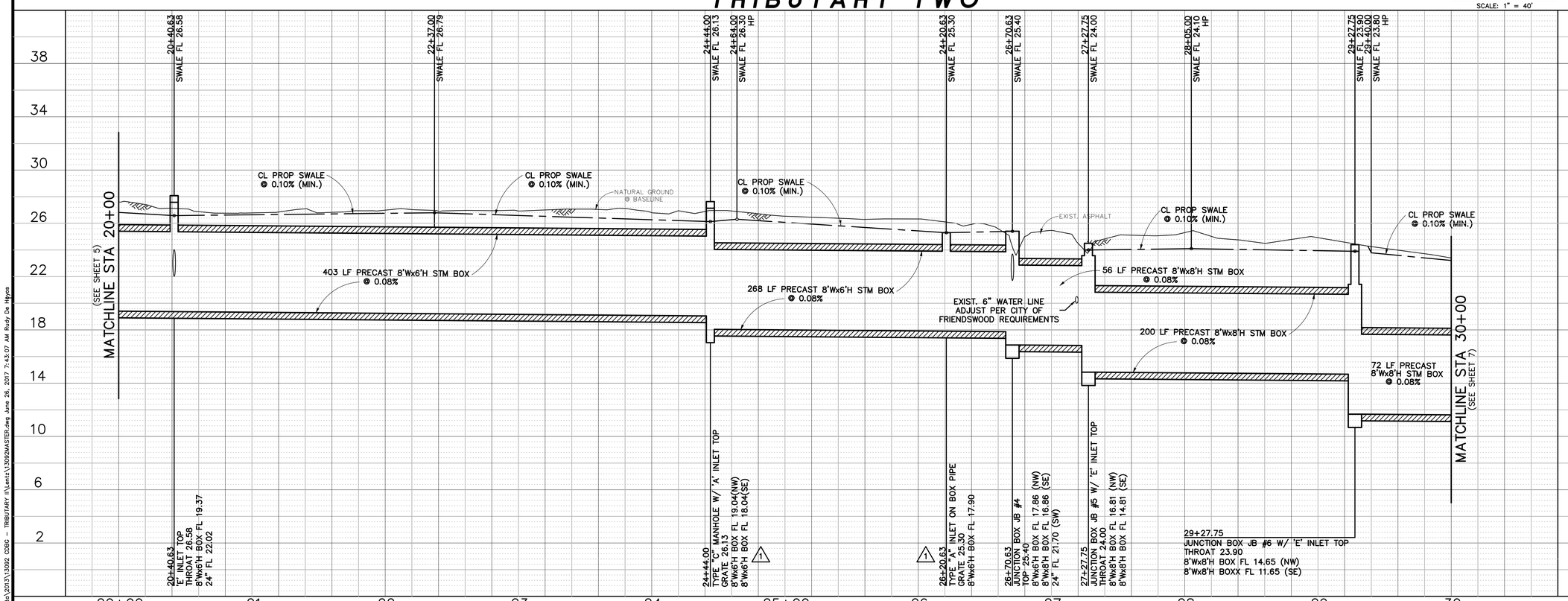
THE FIELD PRIOR TO COMMENCING CONSTRUCTION.

CONSTRUCT SWALE AND VERIFY ADEQUATE DRAINAGE TO CONFIRM GRATE ELEVATIONS PRIOR TO SETTING 'E' INLET TOPS

PRIOR CONSTRUCTION, FLAG ALL SPECIMEN TREES SELECTED FOR REMOVAL AND SCHEDULE A SITE MEETING WITH THE DISTRICT.

TRIBUTARY TWO

SCALE: 1" = 40'



MORAD KABIRI, P.E., AICP
DIRECTOR OF COMMUNITY DEVELOPMENT — DATE

KAZ HAMIDIAN
DIRECTOR OF PUBLIC WORKS — DATE

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PLAN AND PROFILE STA.
20+00 TO 30+00

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
10/26/17

DRAWN BY: B.S.M.	JOB NO.: LE–13092		
DESIGNED BY: J.D.A.	DATE: JUNE, 2017	SHEET NO.	6
APPROVED BY: J.D.A.	SCALE: 1" = 40'		

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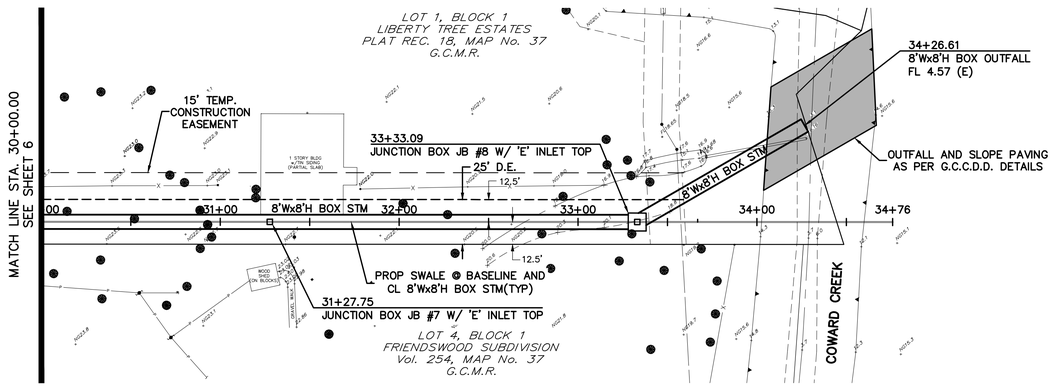

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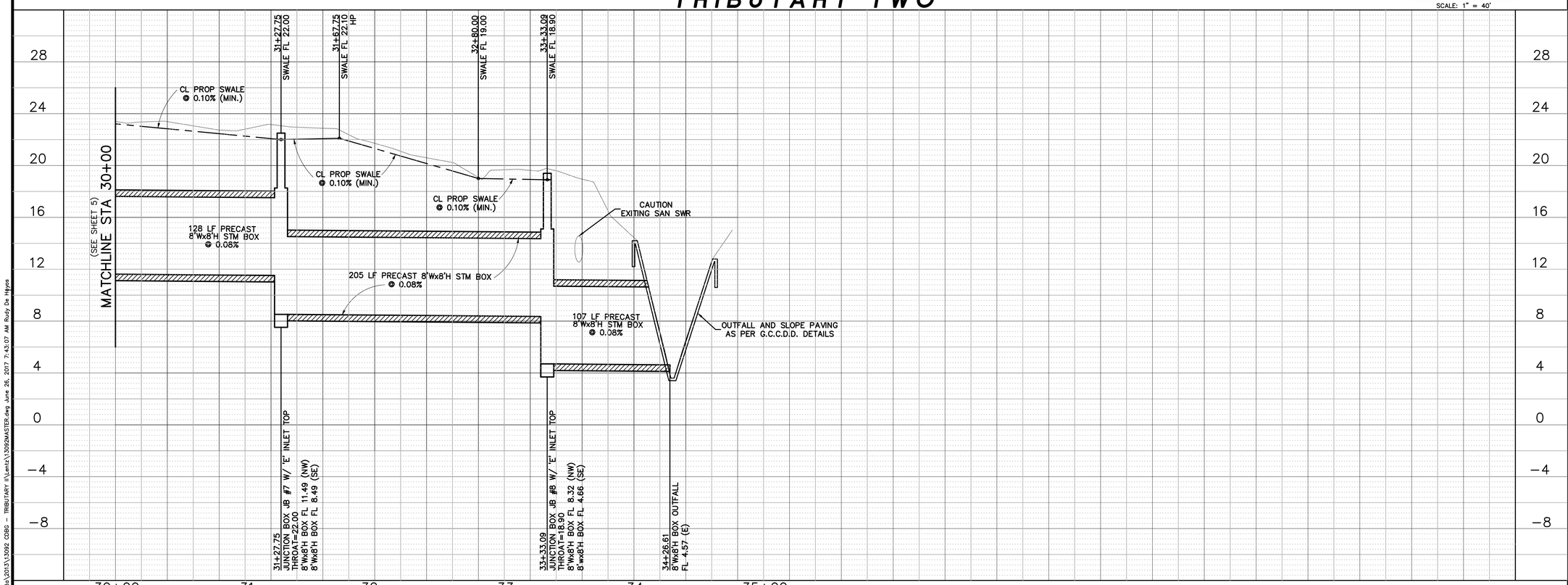

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DATE

KAZ HAMIDIAN
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PLAN AND PROFILE STA.
30+00 TO END

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
10/26/17

DRAWN BY:	B.S.M.	JOB NO.:	LE–13092
DESIGNED BY:	J.D.A.	DATE:	JUNE, 2017
APPROVED BY:	J.D.A.	SCALE:	1" = 40'

SHEET NO. 7

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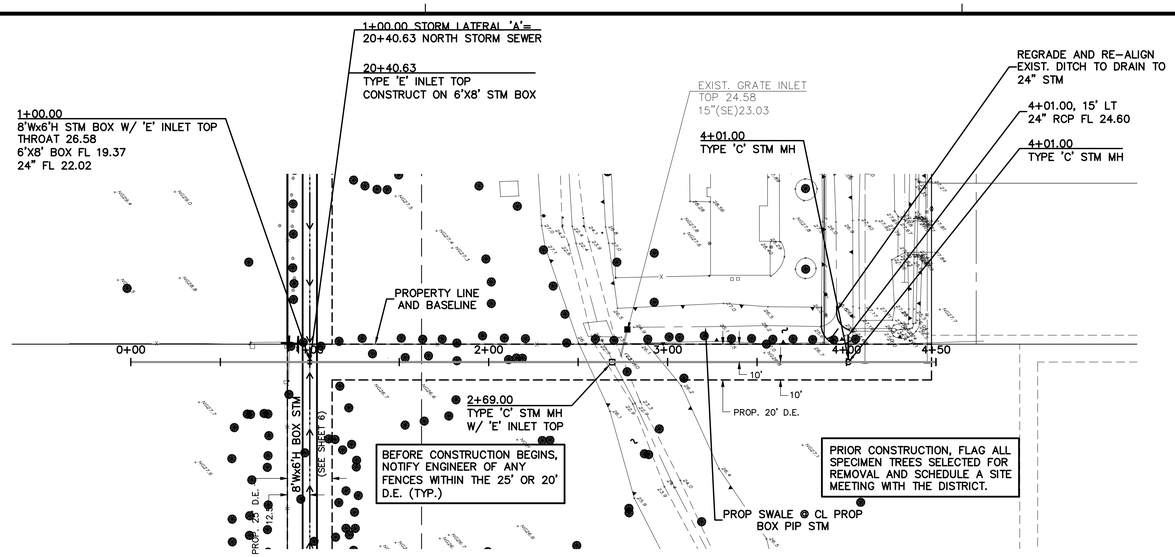

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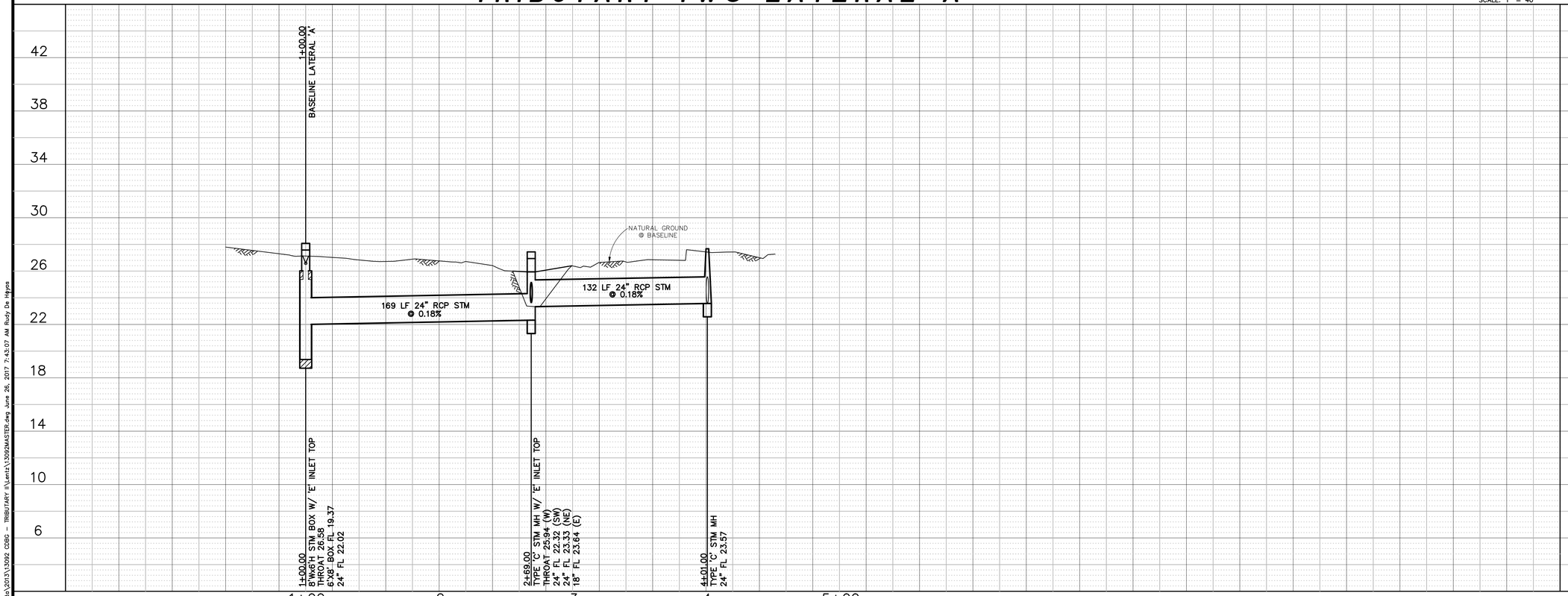
TRIBUTARY TWO LATERAL 'A'

SCALE: 1" = 40'



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PLAN AND PROFILE
LATERAL A

STATE OF TEXAS
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DRAWN BY: B.S.M.	JOB NO.: LE-13092		
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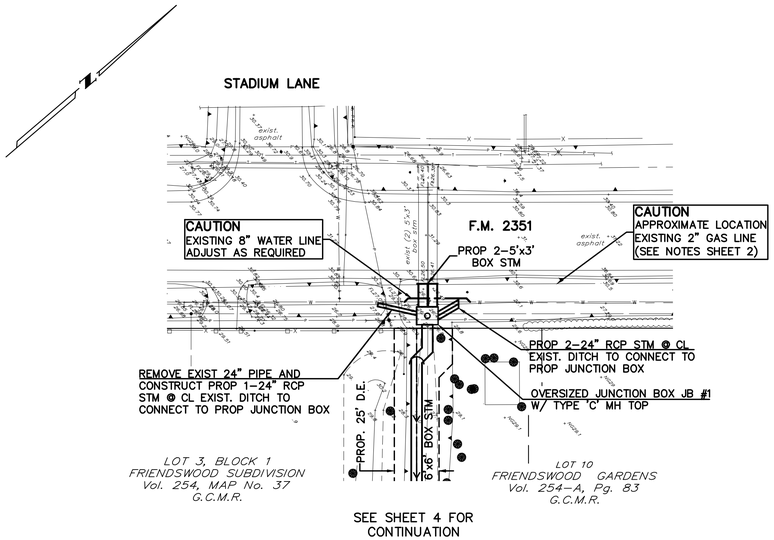
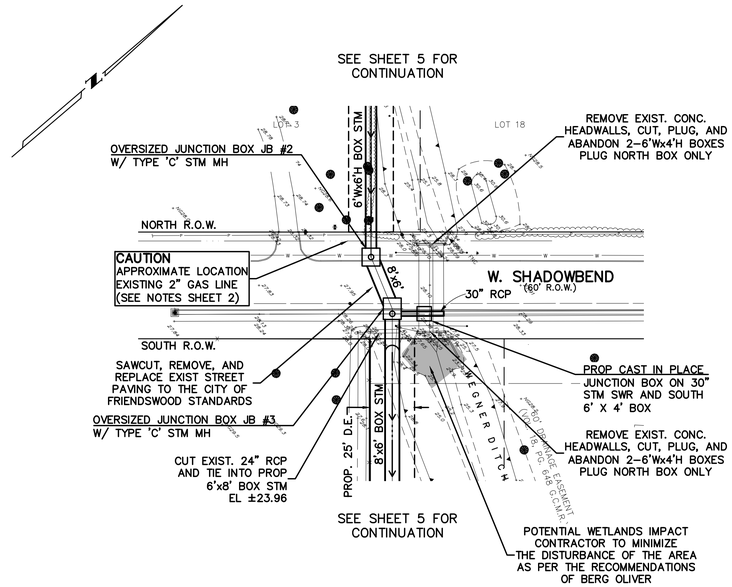


SEE SHEET 4 FOR
CONTINUATION



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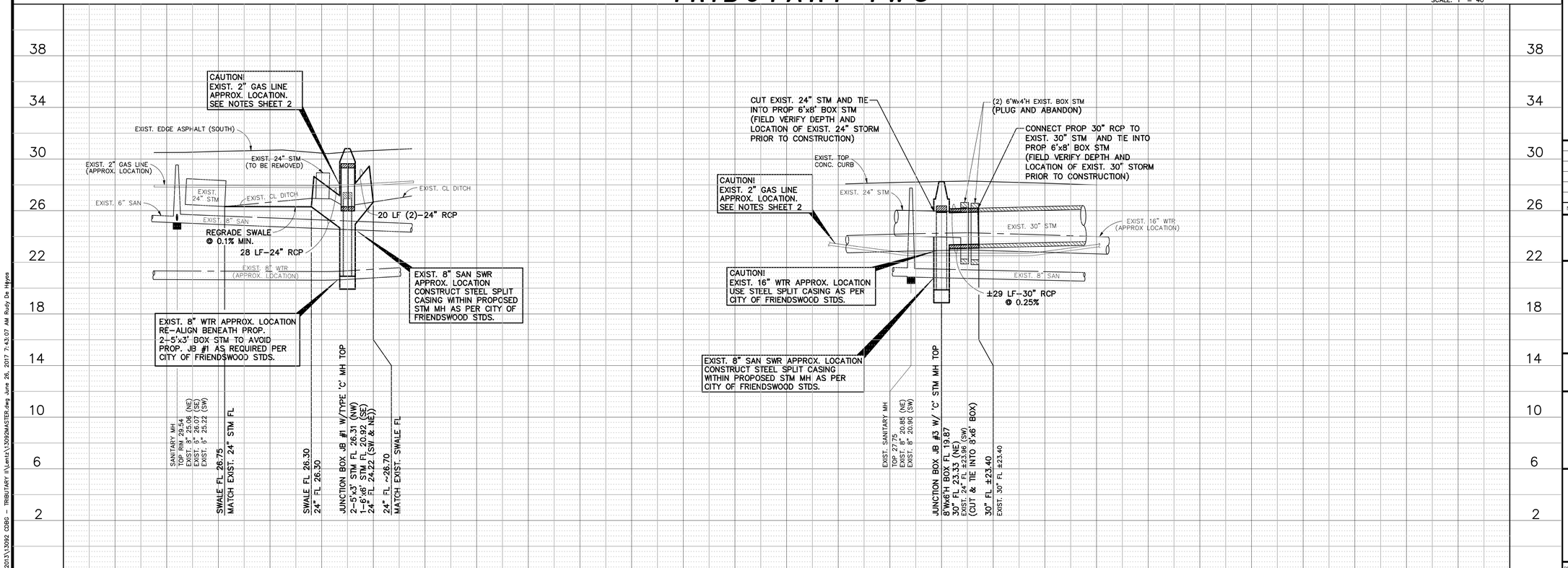

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CROSS SECTION

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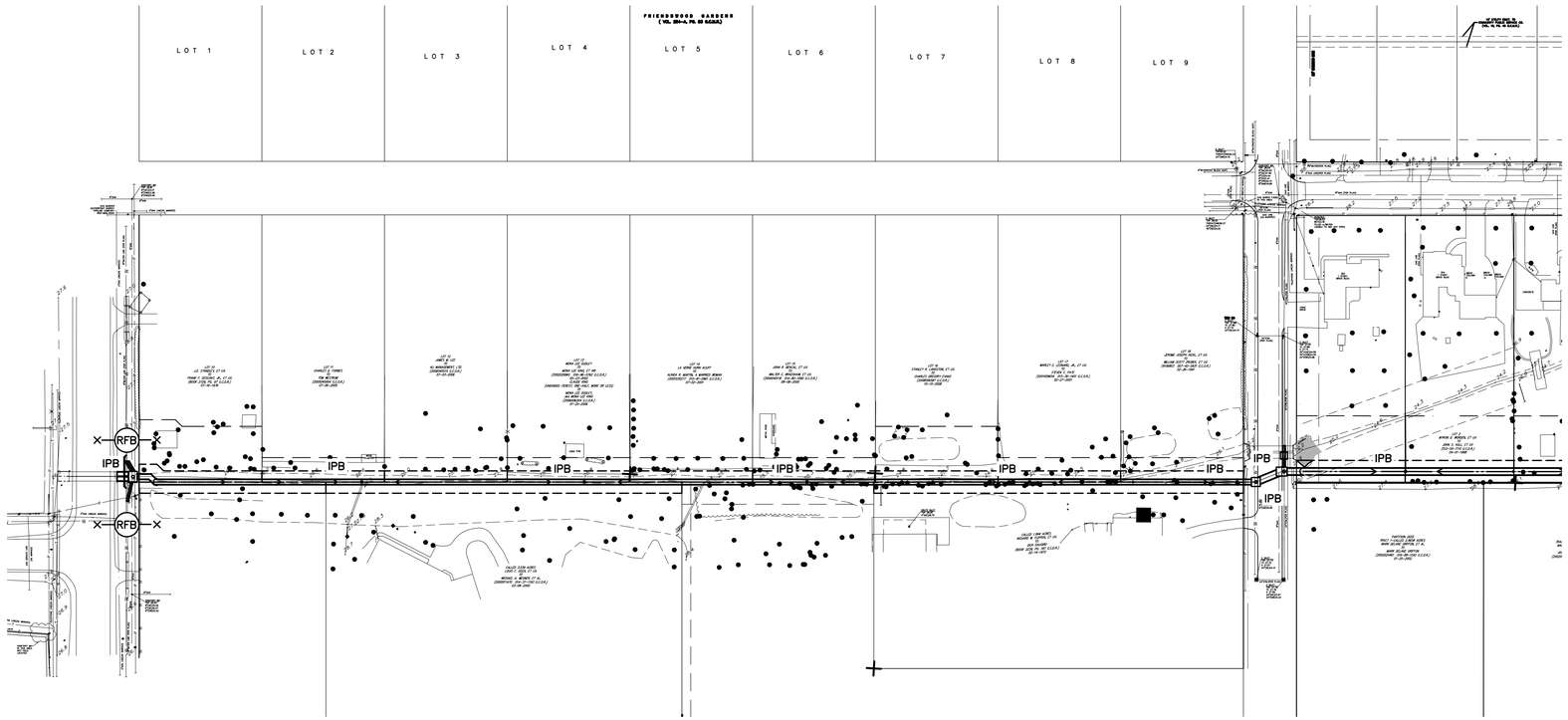

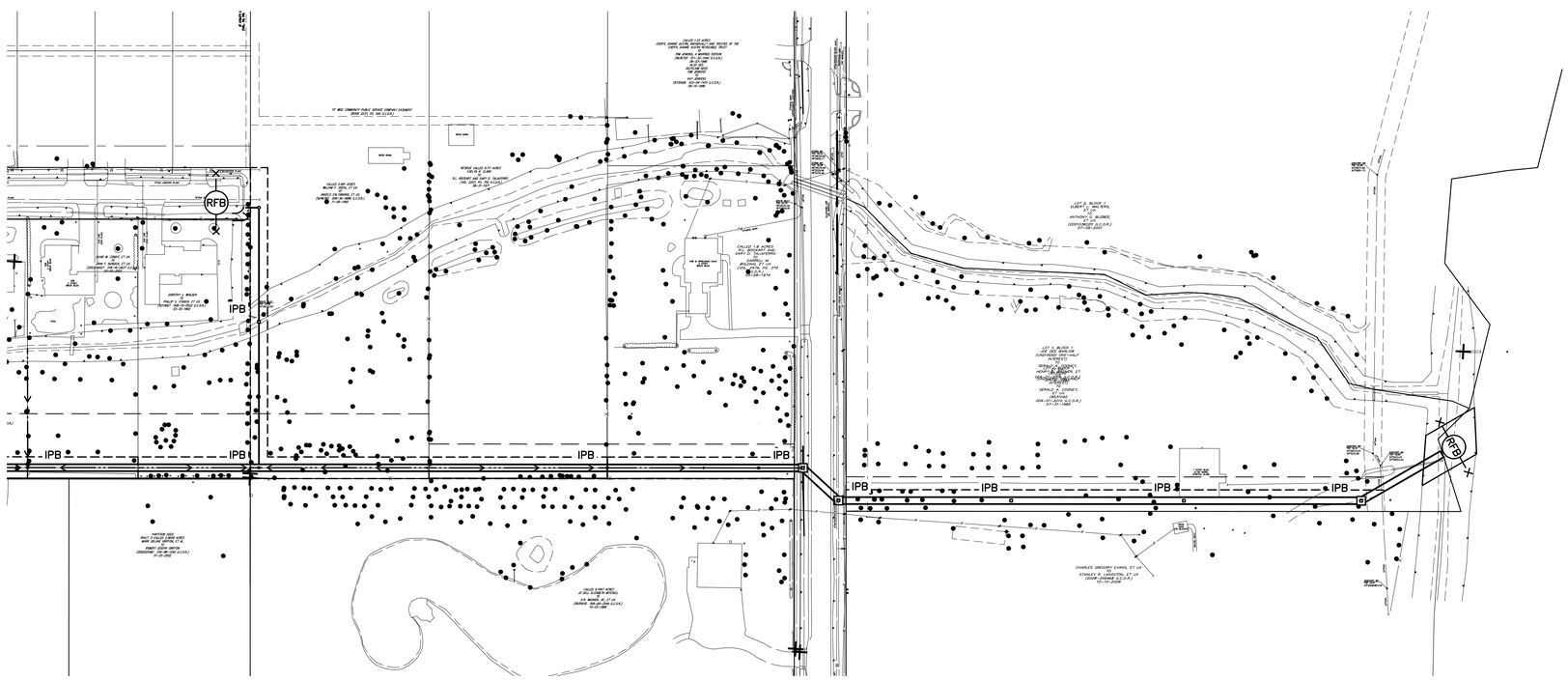

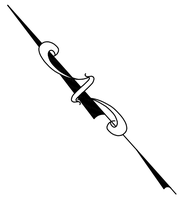

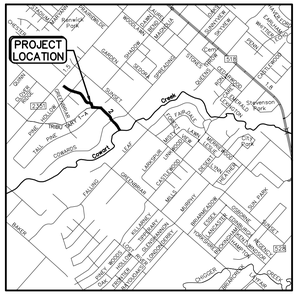

VICINITY MAP

SCALE: 1" = 1/2 MI.

KEY MAP : 656-C

LEGEND

EXISTING

×68.0	ELEVATION
×TC 68.10	TOP OF CURB
×G 67.75	GUTTER
rim 68.85	RIM
fl 65.30	FLOWLINE
	MANHOLE
	CLEAN OUT
	POWER POLE
	DOWN GUY
	FIRE HYDRANT
	WATER VALVE
	WATER METER
	STREET SIGN
	AREA LIGHT
	TELEPHONE ENCLOSURE
	GAS METER
—o——o——o—	CHAIN LINK FENCE
—X——X——X—	BARBED WIRE FENCE
—//——//——//—	WOOD FENCE

PROPOSED

—X—(FF)—X	FILTER FABRIC FENCE
IPB	INLET PROTECTION BARRIER STAGE I OR II AS APPLICABLE
(SC)	STABILIZED CONSTRUCTION ACCESS
—X—(RFB)—X	REINFORCED FILTER FABRIC BARRIER
—(DS)—	DVIERSION SWALE

80 0 80 160

SCALE: 1" = 80'

NO.	DATE	REVISIONS	APP.
1	7/5/16	ACCESS POINT	J.D.A.

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LENTZ ENGINEERING
5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net

COWARD CREEK – TRIBUTARY II
CITY OF FRIENDSWOOD, GALVESTON COUNTY, TEXAS

STORM WATER POLLUTION PREVENTION PLAN

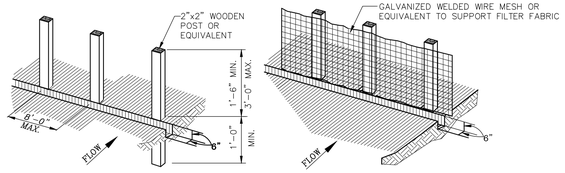
STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
6/26/17

DRAWN BY: B.S.M.	JOB NO.: LE-13092	SHEET NO.	10
DESIGNED BY: J.D.A.	DATE: JUNE, 2017		
APPROVED BY: J.D.A.	SCALE: 1" = 80'		

F:\Data\2013\13092 CDBG – TRIBUTARY II\Lentz\13092MASTER.dwg June 26, 2017 7:43:07 AM Rudy De Hayos

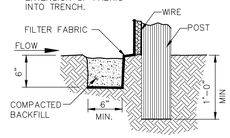
1. SET POSTS AT REQUIRED SPACING AND DEPTH. EXCAVATE 6" x 6" TRENCH UPSLOPE ALONG THE LINE OF POSTS.

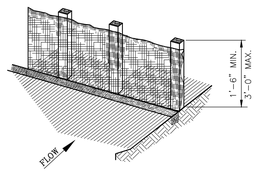
2. SECURE MESH FENCING TO POSTS



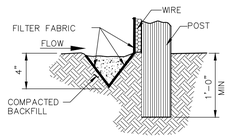
EXTENSION OF FABRIC INTO TRENCH.

3. ATTACH FILTER MATERIAL TO WIRE FENCE AND EXTEND IT INTO THE TRENCH. BACKFILL AND COMPACT THE EXCAVATED SOIL.





ALTERNATE V-TRENCH EXTENSION OF FABRIC INTO TRENCH



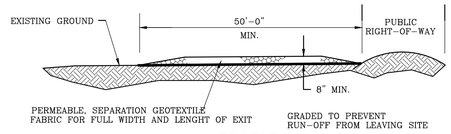
GENERAL NOTES:

1. SECURELY FASTEN MESH FENCING TO POSTS WITH STAPLES OR TIE WIRES.
2. SECURELY FASTEN FILTER FABRIC TO MESH FENCING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT A POST, FOLD TOGETHER, AND ATTACH TO A POST.
4. REMOVE SEDIMENT DEPOSITS WHEN SILT REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE IN DEPTH.

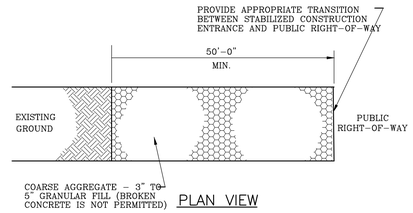
DETAIL
REINFORCED FILTER FABRIC BARRIER

N.T.S.

RFB
SYMBOL



PROFILE



PLAN VIEW

MINIMUM LENGTH IS AS SHOWN ON CONSTRUCTION DRAWINGS OR 50 FEET, WHICHEVER IS MORE.

CONSTRUCT AND MAINTAIN CONSTRUCTION EXIT WITH CONSTANT WIDTH ACROSS ITS LENGTH, INCLUDING ALL POINTS OF INGRESS OR EGRESS.

UNLESS SHOWN ON THE CONSTRUCTION DRAWINGS, STABILIZATION FOR OTHER AREAS WILL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT.

WHEN SHOWN ON THE CONSTRUCTION DRAWINGS, WIDEN OR LENGTHEN STABILIZED AREA TO ACCOMMODATE A TRUCK WASHING AREA. PROVIDE OUTLET SEDIMENT TRAP FOR THE TRUCK WASHING AREA.

PROVIDE PERIODIC TOP DRESSING WITH ADDITIONAL COARSE AGGREGATE TO MAINTAIN THE REQUIRED DEPTH OR WHEN SURFACE BECOMES PACKED WITH MUD.

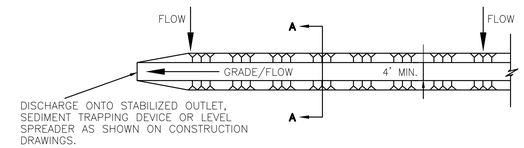
PERIODICALLY TURN AGGREGATE TO EXPOSE A CLEAN DRIVING SURFACE.

ALTERNATIVE METHODS OF CONSTRUCTION INCLUDE
-CEMENT STABILIZED SOIL: COMPACTED CEMENT STABILIZED SOIL, LIMESTONE AGGREGATE, OR OTHER FILL MATERIAL IN AN APPLICATION OF THICKNESS OF 8 INCHES.
-WOOD MATS: OAK OR OTHER HARDWOOD TIMBERS PLACED EDGE TO EDGE AND ACROSS SUPPORT WOODEN BEAMS WHICH ARE PLACED ON TOP OF EXISTING SOIL IN AN APPLICATION THICKNESS OF 6 INCHES.
-STEEL MATS: PERFORATED MATS PLACED ACROSS PERPENDICULAR SUPPORT MEMBERS.

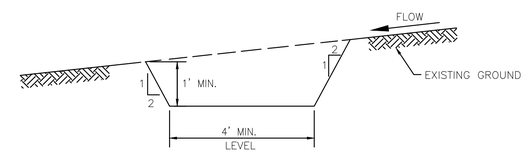
DETAIL
STABILIZED CONSTRUCTION ACCESS

N.T.S.

SC
SYMBOL



DIVERSION SWALE PLAN



SECTION A-A

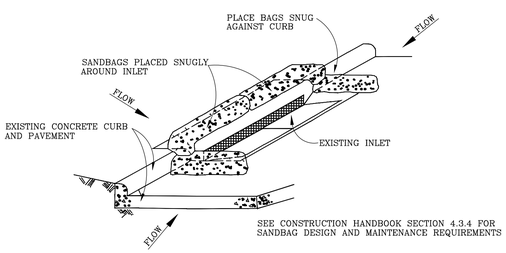
GENERAL NOTES:

1. BOTTOM WIDTH - 4 FEET MINIMUM, CONSTRUCTED LEVEL.
2. DEPTH - 1 FOOT MINIMUM.
3. GRADE - AS SHOWN ON THE CONSTRUCTION DRAWINGS, IF NOT SHOWN, PROVIDE POSITIVE DRAINAGE TO POINT OF DISCHARGE.
4. STABILIZE SOIL WITH APPROPRIATE CONTROL MEASURE (I.E. SOD, HYDROMULCH SEEDING WITH EROSION CONTROL BLANKETS, AGGREGATE, RIPRAP).

DETAIL
DIVERSION SWALE

N.T.S.

DS
SYMBOL



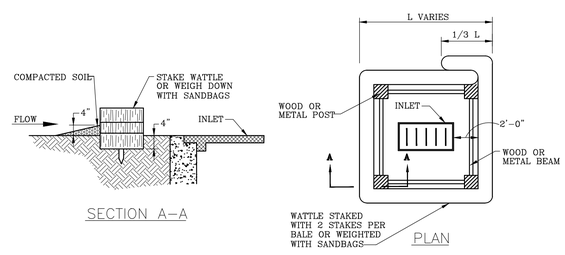
GENERAL NOTES:

1. BAGS OR WATTLES CAN BE USED FOR THIS APPLICATION.
2. PROVIDE WOVEN OR UNWOVEN GEOTEXTILE FILTER FABRIC FOR BAGS.
3. PROVIDE COARSE SAND AND AGGREGATE MIX FOR FILL MATERIAL FOR BAGS. USE ONLY PARTICLES CONSISTING OF CLEAN, HARD, DURABLE MATERIALS FREE FROM ADHERENT COATINGS, SALT, ALKALI, DIRT, CLAY, LOAM, SHALE, SOFT OR FLAKY MATERIALS, OR ORGANIC AND INJURIOUS MATTER.
4. REMOVE SEDIMENT DEPOSIT WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-THIRD THE HEIGHT OF THE BARRIER.

DETAIL
INLET PROTECTIONBARRIERS FOR STAGE II INLETS

N.T.S.

IPB
SYMBOL



NOTE:
TYPICALLY STRAW BALES ARE NOT RECOMMENDED FOR INLET PROTECTION BARRIERS.

DETAIL
INLET PROTECTION BARRIERS FOR STAGE I INLETS

N.T.S.

IPB
SYMBOL

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STORM WATER POLLUTION PREVENTION DETAILS

STATE OF TEXAS
JARROD B. ADEN
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11/28/17

DRAWN BY: B.S.M.	JOB NO.: LE-13092		11
DESIGNED BY: J.D.A.	DATE: JUNE, 2017		
APPROVED BY: J.D.A.	SCALE: N/A		

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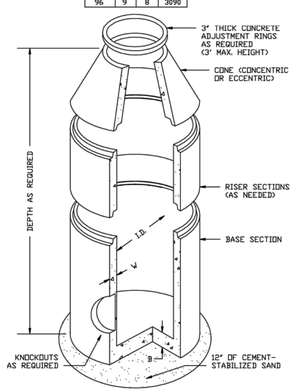
DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090

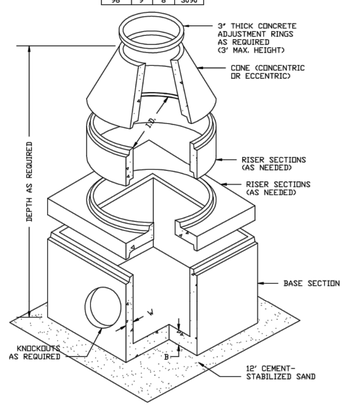


CONCRETE MANHOLE

NOTES:

1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. FOR USE WITH PIPE 72" DIAMETER AND SMALLER ONLY.

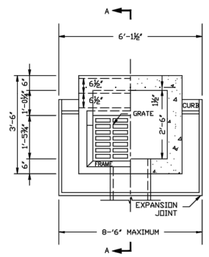
DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090



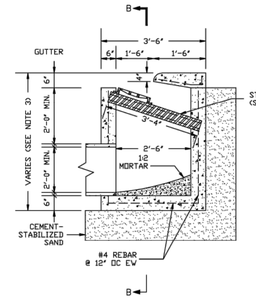
CONCRETE JUNCTION BOX

NOTES:

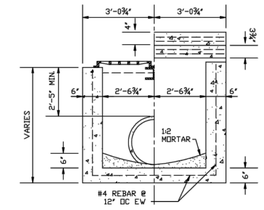
1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. WIDTH VARIES ACCORDING TO PIPE SIZE.



HALF PLAN HALF HORZ. SECTION

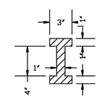


SECTION A–A

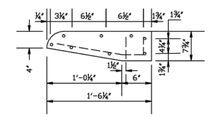


HALF FRONT ELEV. HALF SECTION

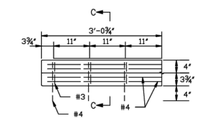
SECTION B–B



I BEAM SECTION



SECTION C–C

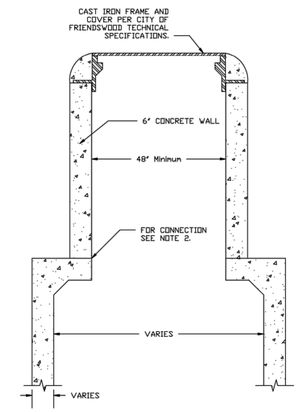


INLET TOP HALF FRONT ELEVATION

TYPE B AND B–B INLET

NOTES:

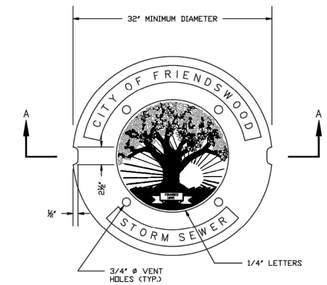
1. USE STANDARD CAST IRON FRAME AND GRATES.
2. LEADS SHALL LEAVE INLET AT LOCATION AND GRADE REQUIRED.
3. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
4. CENTER STEEL BEAM ON INLET AND CAST WALLS AS SHOWN (B–B INLET ONLY).
5. TYPE B AND B–B INLETS ARE FOR RESIDENTIAL USE ONLY.



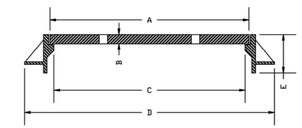
MANHOLE FOR BOX SEWERS

NOTE:

1. "E" INLET GRATE MAY BE USED IN PLACE OF MANHOLE COVER.
2. CONNECT MANHOLE TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.



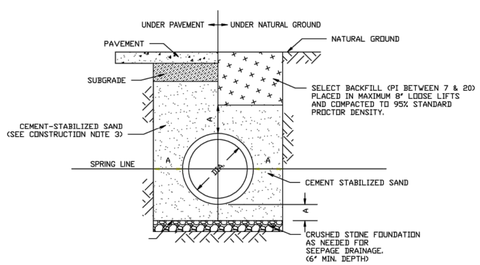
PLAN



SECTION A–A

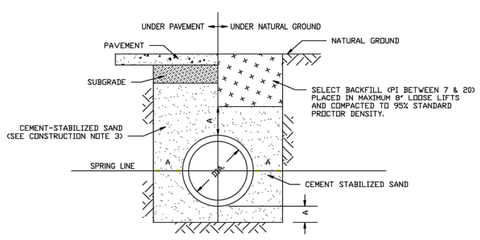
DIMENSIONS					
TYPE	A	B	C	D	E
H-2 INLET	23⅝"	19"	22"	32⅝"	6"
ALL OTHERS	32"	1½"	30"	46"	6⅝"

MANHOLE FRAME AND COVER



UNSATISFACTORY SOIL CONDITIONS

A	STORM SEWER DIAMETER
6"	36" OR LESS
12"	42" OR GREATER

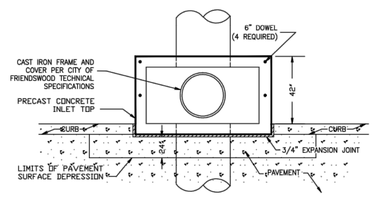


SATISFACTORY SOIL CONDITIONS

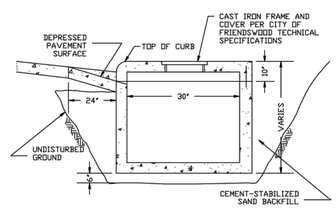
BEDDING AND BACKFILL

NOTES:

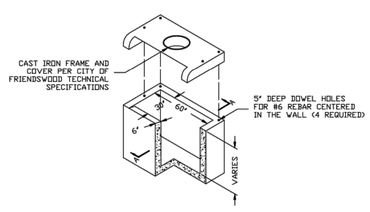
1. THE SATISFACTORY SOIL CONDITIONS METHOD SHALL BE USED FOR STORM SEWER PIPE WHERE THE SOIL CONDITIONS ARE AS FOLLOWS:
   1.A. STRATA FROM THE SPRING LINE TO 3 FT BELOW THE FLOWLINE OF THE PIPE CONSIST OF NON-WATERBEARING COHESIVE SOILS HAVING A SHEAR STRENGTH OF 1000 PSF OR GREATER.
   1.B. NO WET SAND STRATA EXIST IN AREA FROM 1 FT ABOVE THE TOP OF THE PIPE TO 3 FT BELOW THE FLOWLINE.
2. FOR ALL OTHER SOIL CONDITIONS USE THE DETAIL FOR UNSATISFACTORY CONDITIONS SHOWN ABOVE.



PLAN VIEW



SECTION A – A
CROSS SECTION

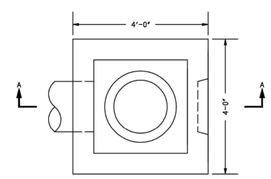


ISOMETRIC VIEW

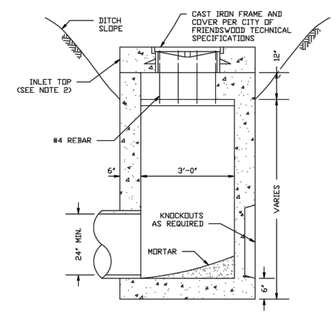
TYPE H–2 INLET

NOTES:

1. H–2 TYPE 1 LENGTH = 5'–0", H–2 TYPE 2 LENGTH 10'–0".
2. THIN WALL KNOCK-OUTS OR THRU HOLES FOR PIPE PER JOB REQUIREMENTS.
3. REFER TO PAVING DETAIL SHEET FOR INSTALLATION OF H–2 TYPE 1 5'–0" CURB INLET.
4. INLET WALLS MAY BE EXTENDED USING PRECAST RISER SECTION.
5. INLET TOPS SHALL BE SECURED TO THE INLET WALL USING #6 DOWELS DRILLED AND GROUTED A MINIMUM DEPTH OF 5" INTO THE INLET WALL.
6. INLET BACKFILL SHALL BE CEMENT-STABILIZED SAND TO THE TOP OF THE INLET FIRST STAGE.
7. GRADE 60, #4 REINFORCEMENT BARS TO CONFORM TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
8. GROUT ALL EXPOSED LIFT HOLES.



PLAN



SECTION A–A

TYPE "E" INLET

NOTES:

1. USE #4 REBAR IN THROAT OPENING AT 6" CENTERS.
2. CONNECT INLET TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.

STORM SEWER CONSTRUCTION NOTES:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C–76, CLASS III, TONGUE AND GROOVE, UNLESS OTHERWISE NOTED AND APPROVED BY THE CITY.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER INSTALLED UNDER PROPOSED PAVEMENT SHALL BE BACKFILLED WITH CEMENT–STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND, TO THE BOTTOM OF THE SUBGRADE. STORM SEWER INSTALLED UNDER EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT–STABILIZED SAND TO THE BOTTOM OF THE PAVEMENT.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS A AND SHALL HAVE A MINIMUM STRENGTH OF 4000 PSI AT 28 DAYS AND HAVE REINFORCING BARS TO MEET AASHTO H20–44 LOADING REQUIREMENTS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE.
6. MINIMUM STORM SEWER SIZE IS TWENTY–FOUR (24) INCH INSIDE DIAMETER. MINIMUM ROADSIDE DITCH CULVERT IS EIGHTEEN (18) INCH INSIDE DIAMETER OR APPROVED EQUAL.
7. ALL STORM SEWER MANHOLES SHALL INCLUDE THE WORDS "STORM SEWER" AND "CITY OF FRIENDSWOOD." MANHOLE COVERS SHALL CONFORM TO THE STANDARD DETAILS SHOWN ON THIS SHEET.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES OF CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWER.
9. ALL INLETS, AT ROADWAY PAVEMENT IN RESIDENTIAL DEVELOPMENTS, SHALL BE TYPE "B", "B–B" OR "H–2". ALL INLETS IN COMMERCIAL DEVELOPMENTS, AND/OR ON MAJOR THOROUGHFARES SHALL BE TYPE "H–2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDRO–MULCHED AS PER TECHNICAL SPECIFICATION SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, THE CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS REMAIN OPEN AND ARE MAINTAINED TO ENSURE POSITIVE DRAINAGE. CONVEYANCES ARE NOT TO BE IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS AND ANY OTHER SUBSTANCES THAT MAY DAMAGE THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. AT COMPLETION OF WORK, THE CONTRACTOR SHALL FILL ALL LOW SPOTS, GRADE ALL RIGHTS–OF WAY, AND UTILITY EASEMENTS, AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
11/22/17

STORM SEWER STANDARD DETAILS

FILE NAME: STORM SEWER STANDARD DETAILS 2009.DWG

DATE APPROVED: OCTOBER 2010

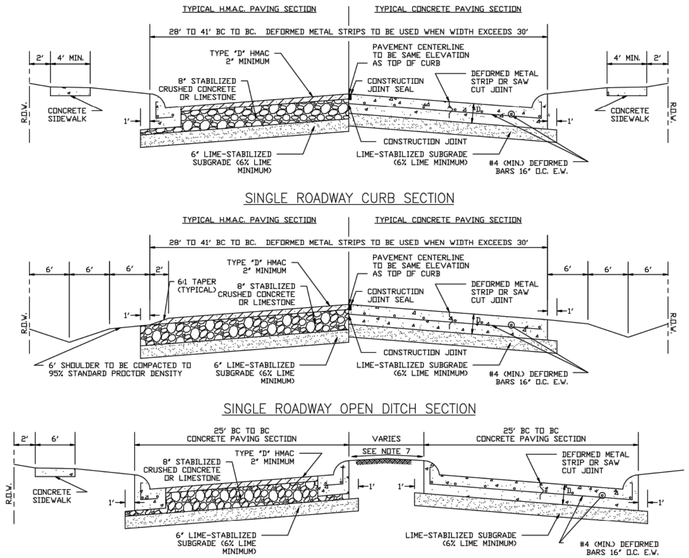
SCALE: NTS | REVISED DATE: AUGUST 2010

COMMUNITY DEVELOPMENT DEPARTMENT

COWARD CREEK – TRIBUTARY II
CITY OF FRIENDSWOOD,
GALVESTON COUNTY, TEXAS

PROJECT NUMBER: LE–13092

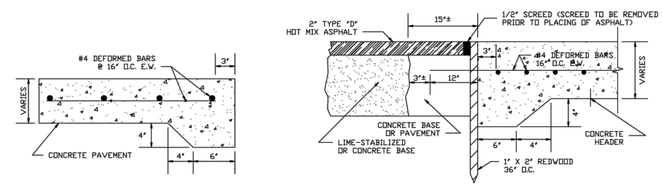
DATE SUBMITTED:



ROADWAY SECTIONS

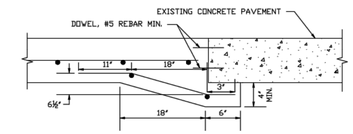
NOTES:

1. FOR ALL SIX (6) AND SEVEN (7) INCH PAVING USE #4 REBAR ON SIXTEEN (16) INCH CENTERS EACH WAY.
2. ALL REINFORCING BAR SHALL CONFORM TO ASTM A15-54T AND A305-53T.
3. THE LOCATION OF CONSTRUCTION JOINTS, CONTROL JOINTS AND DEFORMED STRIPS MAY BE VARIED, WITH THE APPROVAL OF THE CITY OF FRIENDSWOOD, TO SUIT THE PROPOSED CONSTRUCTION METHODS OF THE CONTRACTOR. THE MAXIMUM LENGTH BETWEEN LONGITUDINAL JOINTS SHALL NOT EXCEED 15' - 0".
4. ALL PAVEMENT CROSS-SECTION SHALL EITHER BE HYPERBOLIC OR TANGENT CROWN. MINIMUM SLOPE SHALL BE ONE-QUARTER (¼) INCH PER FOOT.
5. D = SIX (6) INCH OR SEVEN (7) INCH. SEE PAVING CONSTRUCTION ITEMS ON THIS SHEET.
6. MINIMUM SLOPE FOR ANY MEDIAN SHALL BE ONE-HALF (½) INCH PER FOOT.



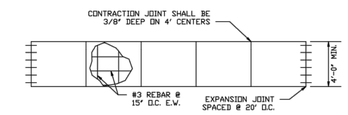
CONCRETE PAVING HEADER

ASPHALT PAVING HEADER

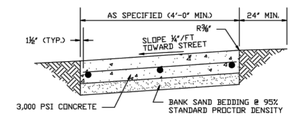


UNDERCUT DETAIL

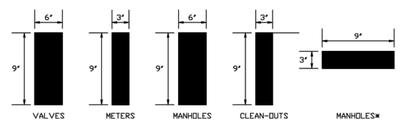
PAVING HEADERS



SIDEWALK PLAN VIEW



SIDEWALK SECTION

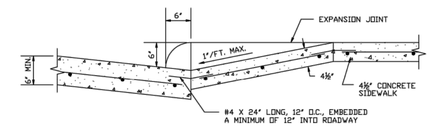


WATER LINES SANITARY SEWER STORM SEWER

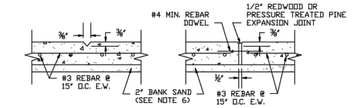
UTILITY MARKINGS

NOTES:

1. SAW CUT CURB OR EDGE AND APPLY APPROPRIATE MARKING AS LISTED BELOW.
2. WATER VALVE MARKING SHALL BE 6" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
3. WATER METER MARKING SHALL BE 3" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
4. SANITARY SEWER MANHOLE MARKING SHALL BE 6" X 9" IN SIZE MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
5. SANITARY SEWER CLEAN-OUT MARKING SHALL BE 3" X 9" IN SIZE AND MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
6. STORM SEWER MANHOLE MARKING SHALL BE 9" X 3" IN SIZE AND MARKED IN BLACK PAINT. *ONLY STORM SEWER MANHOLES SHALL BE MARKED NOT, INLETS.



SIDEWALK & WHEEL CHAIR RAMP SECTION

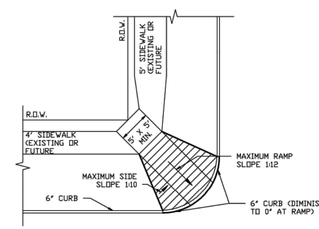


CONTRACTION JOINT EXPANSION JOINT

SIDEWALK JOINTS

NOTES:

1. ALL EDGES SHALL BE ROUNDED WITH ¾" RADIUS.
2. CONTRACTION JOINTS SHALL BE PLACED AT 4'-0" INTERVALS.
3. CONTRACTION JOINTS SHALL BE ¾" DEEP AND HAVE TROWEL EDGE.
4. ¼" EXPANSION JOINT MATERIAL REQUIRED WHERE SIDEWALKS ABUT BUILDINGS, CURBS, DRIVEWAYS, OR EXISTING SIDEWALKS.
5. EXPANSION JOINTS SHALL BE PLACED AT 20'-0" INTERVALS.
6. 2 INCH CLEAN BANK SAND SHALL BE TAMPED TO 95% STANDARD PROCTOR.
7. WHERE NEW SIDEWALK IS PLACED AGAINST EXISTING SIDEWALK, SAW CUT EXISTING SIDEWALK TO AN EVEN STRAIGHT LINE PRIOR TO INSTALLATION OF THE NEW SIDEWALK INSTALL #4 REBAR DOWEL INTO EXISTING SIDEWALK.

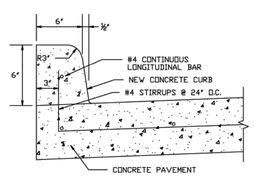


WHEELCHAIR RAMP – PLAN VIEW

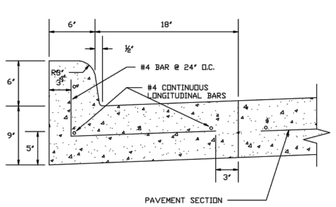
NOTES:

1. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
2. FINISHED SURFACE OF WHEELCHAIR RAMP AND SIDE SLOPE SHALL BE GROOVED LATERALLY WITH ¼" WIDE BY ¼" DEEP GROOVES, SPACED AT 2¾" O.C. WITH BLACK BROOM FINISH. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
3. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
4. MINIMUM CLEARANCE (WIDTH) OF RAMP SHALL BE THIRTY-SIX (36) INCHES.
5. FINISH SURFACES OF RAMP AND SIDE SLOPE SHALL BE TREATED WITH COLOR SO THAT THE SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
6. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE BLACK DYE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.

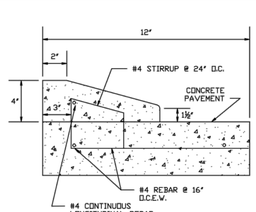
SIDEWALKS AND WHEELCHAIR RAMPS



TYPE I – 6" CONCRETE CURB



TYPE II – MONOLITHIC CONCRETE CURB AND GUTTER

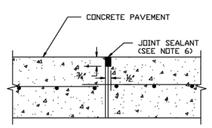


TYPE III – 4" x 12" CONCRETE CURB

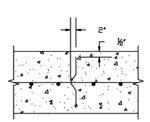
CONCRETE CURB

NOTE:

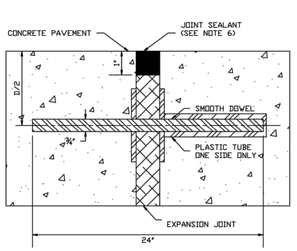
1. WHEN CONCRETE CURB IS TO BE PLACED ON EXISTING CONCRETE DOWEL IN #3 DEFORMED BARS @ 36" O.C. AND SET IN SULFUR, OR QUICK SETTING CEMENT.
2. MORTAR FINISH IS NOT REQUIRED WHEN CURB IS PLACED BY A MACHINE, BUT CURB SHALL STILL HAVE THE SAME OUTSIDE DIMENSIONS.



CONSTRUCTION JOINT



DEFORMED METAL STRIP

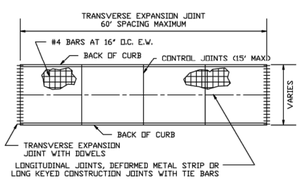


DOWEL EXPANSION JOINT

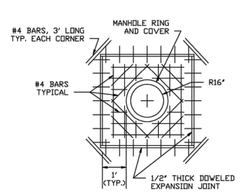
NOTES:

1. CANTILEVER TYPE. CAST MALLEABLE IRON LOAD TRANSMISSION UNIT-STARLUG MODEL D-27 OR EQUAL ON 22" O.C. ARE ACCEPTABLE ALTERNATIVES.
2. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED A MINIMUM OF 40'-0" APART. MATCH TO EXPANSION JOINTS IN PAVING PANELS.
3. STAKES FOR TRANSVERSE JOINTS SHALL NOT BE PLACED CLOSER THAN 6" TO A LONGITUDINAL JOINT. THE TOP OF STAKE SHALL NOT BE LESS THAN ¼" BELOW THE FINISH SURFACE.
4. LOCATION OF CONSTRUCTION JOINTS AND DEFORMED STRIPS MAY BE VARIED WITH THE APPROVAL OF THE CITY, TO SUIT PROPOSED CONSTRUCTION OF THE CONTRACTOR.
5. CONTROL JOINTS SHALL BE SPACED AT A MAXIMUM OF 15'-0".
6. JOINTS AND SEALANTS SHALL ADHERE TO CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION 02840 - CONCRETE PAVEMENT JOINTS.

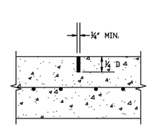
PAVEMENT JOINTS



PAVING PANEL



MANHOLE BLOCKOUT



CONTRACTION JOINT

NOTES:

1. D = DEPTH OF CONCRETE.
2. SAW-CUT CONTRACTION JOINT TO DIMENSIONS SHOWN.

PAVING CONSTRUCTION NOTES:

1. PAVEMENT AND SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISION.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD PROJECT MANAGER AT 281-996-3201 A MINIMUM OF TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL TURN-OUTS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD), LATEST EDITION, SHALL BE OBSERVED.
5. ALL FILL IN EXISTING RIGHTS-OF-WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF TWELVE (12) INCHES OR LESS AND COMPACTED TO A NINETY-FIVE (95) PERCENT STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE 60, NO. 4 REBAR, SPACED AT SIXTEEN (16) INCHES ON CENTER, EACH WAY.
7. ALL RESIDENTIAL OR COLLECTION PAVEMENT TO BE A MINIMUM OF SIX (6) INCHES THICK REINFORCED CONCRETE, UNLESS OTHERWISE NOTED.
8. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET BACK OF CURB TO BACK OF CURB:

8.1. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.

8.2. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.

9. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET FROM BACK OF CURB TO BACK OF CURB AND MAJOR ARTERIAL THOROUGHFARES:

9.1. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

9.2. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.

10. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MINIMUM SIXTY (60) FEET INTERVALS.
11. ALL CONCRETE USED FOR PAVEMENT SHALL BE "CLASS A" CONCRETE, MINIMUM OF 5.0 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE, 3,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS.
12. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF SIX PERCENT (6%).
13. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST EDITION.
14. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
15. FOR ALL CONCRETE TO BE REMOVED, A MINIMUM TWO (2) INCH DEEP SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
16. REPRESENTATIVES FROM THE CITY OF FRIENDSWOOD, THE OWNER, AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL GRADATIONS, DENSITY TESTING, LIME OPERATIONS, AND PLACEMENT OF CONCRETE OR ASPHALT PAVING.
17. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TESTS HAVE BEEN TAKEN.
18. BLUE REFLECTORIZED RAISED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO FIRE HYDRANT LOCATIONS AT A POINT OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY (REFLECTORS SHALL FACE TRAFFIC FLOW).
19. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION, OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY OTHER SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER

PAVING STANDARD DETAILS

FILE NAME: PAVING STANDARD DETAILS 2009.DWG

DATE APPROVED: OCTOBER 2010

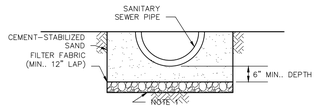
SCALE: NTS | REVISED DATE: AUGUST 2010

FRIENDSWOOD TEXAS

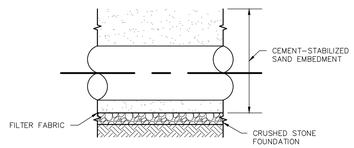
COMMUNITY DEVELOPMENT DEPARTMENT

COWARD CREEK – TRIBUTARY II
CITY OF FRIENDSWOOD,
GALVESTON COUNTY, TEXAS

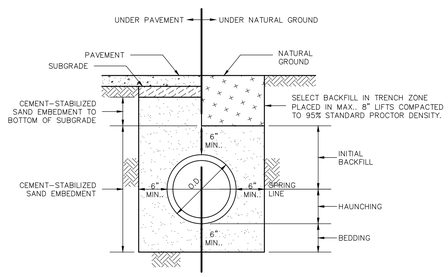
PROJECT NUMBER: LE-13092 | DATE SUBMITTED: | SHEET: 13 OF 21



WET BEDDING CROSS-SECTION



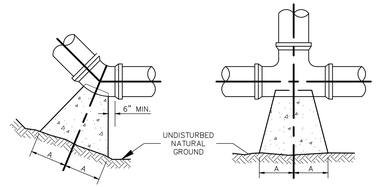
WET BEDDING LONGITUDINAL-SECTION



DRY STABLE TRENCH

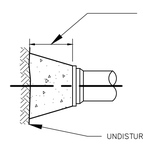
GRAVITY LINE BEDDING AND BACKFILL

SIZE	90° BEND		45° BEND		22 ½° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	A	B
4"	10"	7"	6"	7"	3"	7"	7"	7"	10"	20"
6"	15"	10"	8"	10"	6"	8"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	28"
10"	28"	17"	14"	17"	10"	15"	16"	20"	14"	30"
12"	29"	21"	16"	21"	11"	18"	18"	24"	16"	41"
14"	35"	24"	18"	24"	12"	20"	22"	27"	18"	45"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"

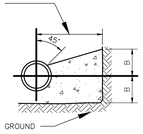


BEND

TEE



PLUG

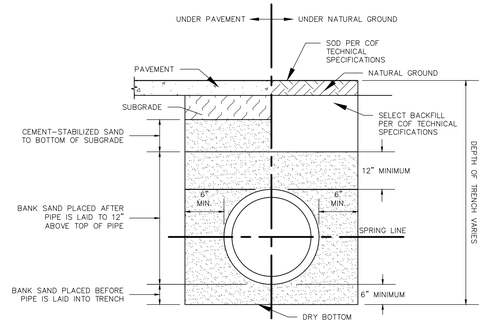


PROFILE VIEW

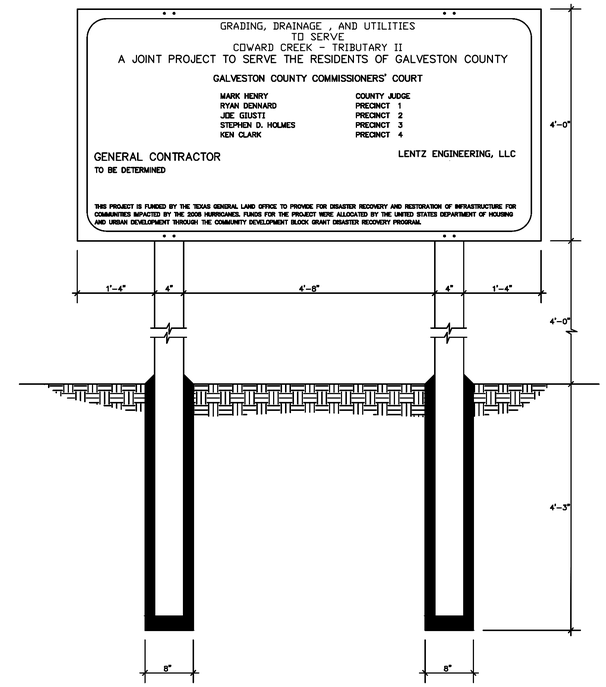
THRUST BLOCK

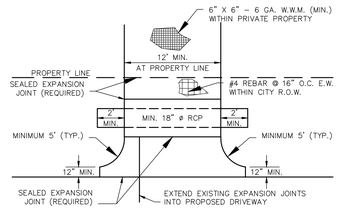
NOTES:

1. THRUST BLOCKS AT TRENCH FACE SHALL HAVE A MINIMUM BEARING SURFACE OF 10 SF AND THE LEAST DIMENSION SHALL BE NO SMALLER THAN 1.5 TIMES PIPE DIAMETER.
2. FROM THE BACK OF PIPE TO THE TRENCH WALL SHALL BE A MINIMUM OF 18" FOR PIPE DIAMETERS OF 10 INCHES AND LESS, AND A MINIMUM OF 24" FOR PIPE DIAMETERS OF 12 INCHES OR GREATER.
3. ALL CONCRETE SHALL BE CLASS "C" AS PER COF TECHNICAL SPECIFICATIONS.

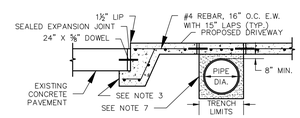


BEDDING AND BACKFILL

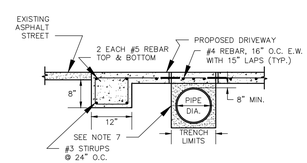




PLAN - ALL STREETS



PROFILE - CONCRETE STREETS

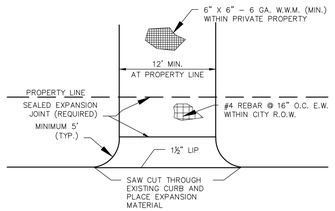


PROFILE - ASPHALT STREETS

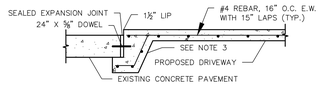
RESIDENTIAL CONCRETE DRIVEWAY
(OPEN DITCH STREETS)

NOTES:

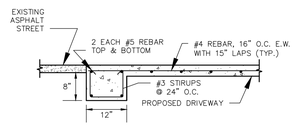
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1½" LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4" X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 3,000 PSI AT TWENTY-EIGHT DAYS.
7. USE MATERIAL AND DIMENSION AS SPECIFIED IN STORM SEWER DETAILS FOR TRENCH WIDTHS AND BACKFILL.
8. NO MORE THAN ONE (1) DRIVEWAY ON LOTS WITH LESS THAN 120' OF FRONTAGE.



PLAN - ALL STREETS



PROFILE - CONCRETE STREETS



PROFILE - ASPHALT STREETS

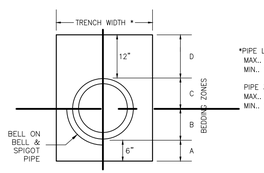
RESIDENTIAL CONCRETE DRIVEWAY
(CURB & GUTTER STREETS)

NOTES:

1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1½" LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4" X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 3,000 PSI AT TWENTY-EIGHT DAYS.

BEDDING ZONE				
PIPE MATERIAL	A	B	C	D
CAST IRON	BS	BS	BS	EF
DUCTILE IRON (PRESSURE)	BS	BS	BS	EF
DUCTILE IRON (GRAVITY)	CS	CS	CS	EF
PVC (PRESSURE PIPE)	BS	BS	BS	EF
PVC (GRAVITY PIPE)	CS	CS	CS	EF
STEEL	BS	BS	BS	EF

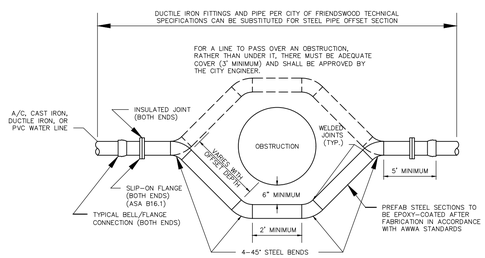
BS-BANK SAND
AB-AGGREGATE BEDDING (WET CONDITIONS ONLY)
ES-SELECT EARTH PLACED SAME DAY PIPE IS LAID
EF-EARTH FILL PLACED NEXT DAY (OR LATER) AFTER PIPE IS LAID
CS-CEMENT STABILIZED SAND



*PIPE LESS THAN 30" MAX.. 1'-6" + DIAMETER MIN.. 1'-0" + DIAMETER

PIPE 30" AND LARGER MAX.. 2'-0" + DIAMETER MIN.. 1'-4" + DIAMETER

ORDINARY TRENCH EMBEDMENT & BACKFILL DETAIL



MINIMUM WALL THICKNESS FOR PIPE AND FITTINGS	
4"	0.250"
6"	0.280"
8"	0.322"
≥ 12"	0.375"

TYPICAL STEEL SECTION FITTINGS	
QTY.	DESCRIPTION
4	8" X 45° STEEL BENDS
2	8" BELL-FLANGE ADAPTERS
2	8" SLIP-ON FLANGES 150#
2	8" INSULATED JOINT KITS

STEEL PIPE OFFSET SECTION

1. ALL MATERIALS AND COATINGS SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. INSULATED JOINT SHALL BE MADE UP USING INSULATING GASKETS, PLASTIC BOLT SLEEVES AND WASHERS OF INSULATING GASKET MATERIAL BACKED WITH STAINLESS STEEL WASHERS OR OTHER METHODS APPROVED BY THE CITY ENGINEER.
4. NO FIELD FABRICATION OR INTERIOR COATING OF STEEL WATER PIPE OFFSETS ALLOWED.

NO.	DATE	REVISIONS	APP.
1	7/5/16	ACCESS POINT	J.D.A.

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5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net
LENTZ ENGINEERING

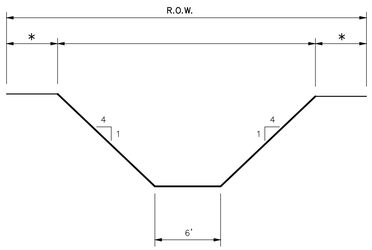
COWARD CREEK - TRIBUTARY II
CITY OF FRIENDSWOOD, GALVESTON COUNTY, TEXAS

MISCELLANEOUS DETAILS

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
06/26/17

DRAWN BY: B.S.M.	JOB NO.: LE-13092	SHEET	14
DESIGNED BY: J.D.A.	DATE: JUNE, 2017		
APPROVED BY: J.D.A.	SCALE: N/A		

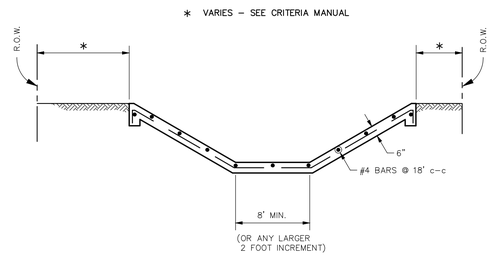
F:\Data\2013\13092 CDBG - TRIBUTARY II\Lentz\13092MASTER.dwg June 26, 2017 7:43:07 AM Rudy De Hypos



* 25' MINOR CHANNELS
* 30' MAJOR CHANNELS

TYPICAL CHANNEL SECTION

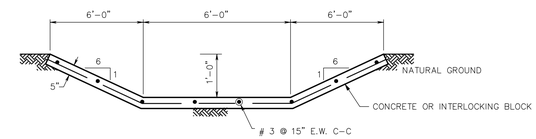
N.T.S.



A) MAX. SIDE SLOPE 1-1/2 : 1 (CONFIRMED WITH GEOTECHNICAL ANALYSIS)
B) WELDED WIRE MESH IS NOT ALLOWED.

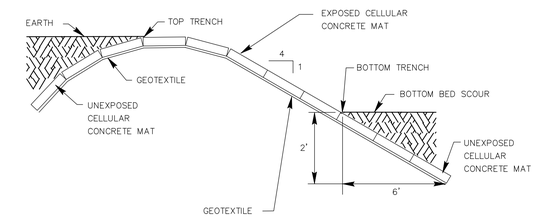
TYPICAL SECTION
CONCRETE TRAPEZOIDAL

N.T.S.



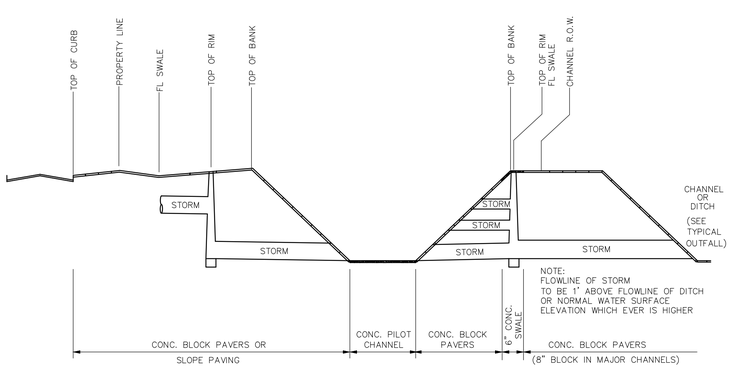
EMERGENCY OVERFLOW SWALE

N.T.S.



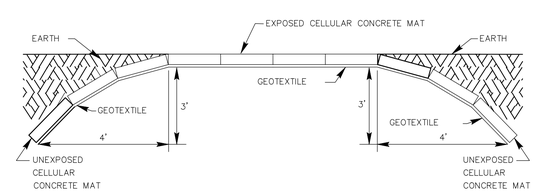
STANDARD SLOPE 4:1

N.T.S.



TYPICAL POND SECTION

N.T.S.



SIDE TURNDOWN

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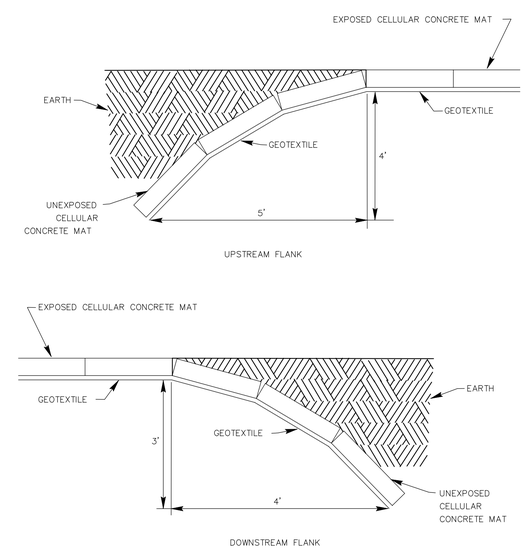

UPSTREAM AND DOWNSTREAM FLANK

N.T.S.

NO.	DATE	REVISIONS	APP.
1	07/28/10	EFFECTIVE	AEL

GALVESTON COUNTY CONSOLIDATED DRAINAGE DISTRICT

Galveston County Consolidated Drainage District

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER

5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net
LENTZ ENGINEERING

UNIT NO.:		
DRAWN BY:	GALVESTON COUNTY, TEXAS	
DESIGNED BY:	STANDARD DETAILS	SCALE: N.T.S.
APPROVED BY: A.E.L.		DATE: JULY 28, 2010
JOB NO.: LE-09051	SHEET 19 OF 30	SHEET NO.: 15 OF 21

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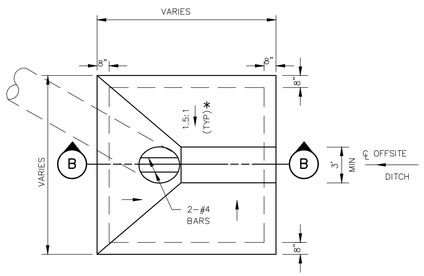
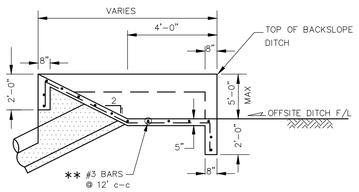


* OR MATCH OFFSITE DITCH SLOPE
** WELDED WIRE MESH IS NOT ALLOWED

PLAN



SECTION B

TYPICAL BACKSLOPE DITCH INTERCEPTOR STRUCTURE

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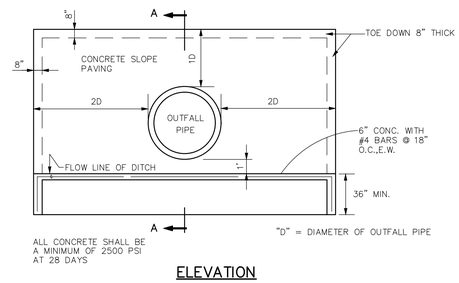
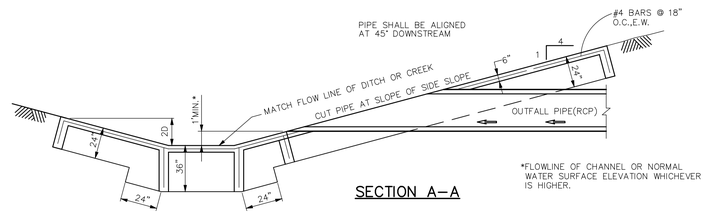


ELEVATION



SECTION A-A

TYPICAL SECTION OUTFALL PIPE TO DISTRICT FACILITIES

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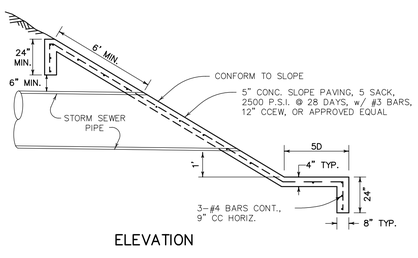

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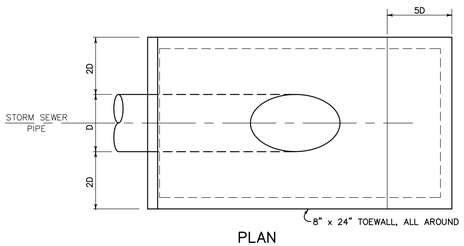
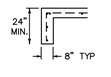


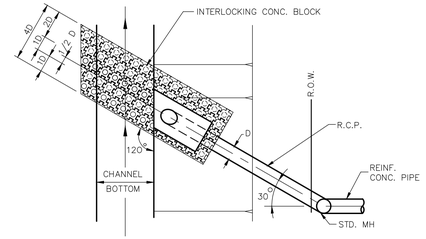
PLAN



TYPICAL SECTION TOEWALL

STORM SEWER OUTFALL STRUCTURE TO POND

N.T.S.



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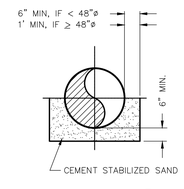
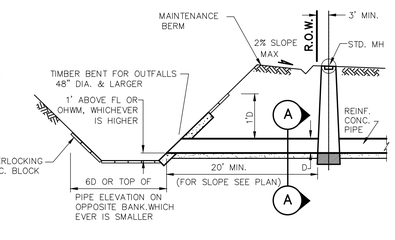


SECTION A

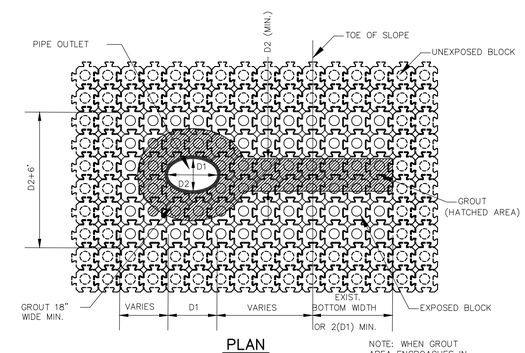


NOTE:
OHWM-ORDINARY HIGH WATER MARK

ELEVATION

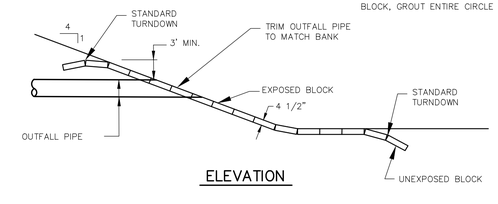
TYPICAL STORM SEWER OUTFALL STRUCTURE LAYOUT - NON-DISTRICT FACILITIES

N.T.S.



PLAN

NOTE: WHEN GROUT AREA ENCROACHES IN THE CIRCULAR VOID AREA IN THE MIDDLE OF THE BLOCK, GROUT ENTIRE CIRCLE



ELEVATION

STORM SEWER OUTFALL NON-DISTRICT FACILITIES

N.T.S.

NO.	DATE	REVISIONS	APP.
1	07/28/10	EFFECTIVE	AEL

GALVESTON COUNTY CONSOLIDATED DRAINAGE DISTRICT

STATE OF TEXAS
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LENTZ ENGINEERING

UNIT NO.:			
DRAWN BY:	GALVESTON COUNTY, TEXAS		
DESIGNED BY:	STANDARD DETAILS	SCALE:	N.TS.
APPROVED BY: A.E.L.		DATE:	JULY 28, 2010
JOB NO.: LE-09051	SHEET 20 OF 30	SHEET NO.:	16 OF 21

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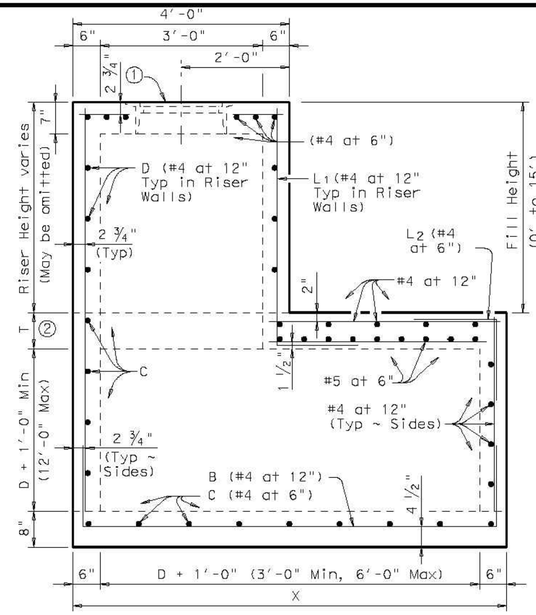
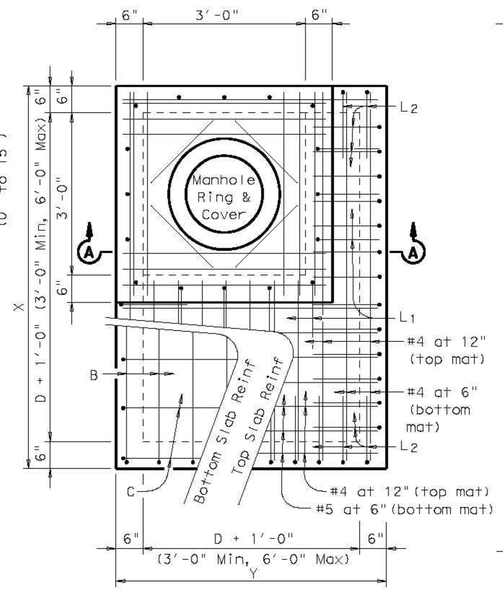
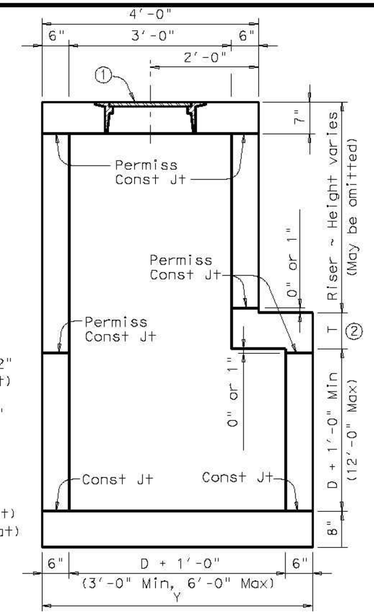


ELEVATION

D = Maximum inside diameter of any Pipe entering the side shown or the opposite side



PLAN

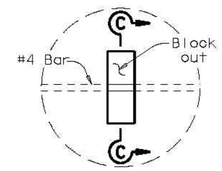


SECTION A-A

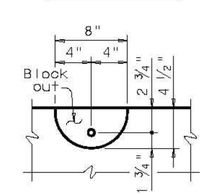
MANHOLE WITH CAST-IN-PLACE RISER

① See Ring and Cover Details

② For Fill Height less than or equal to 10', T=8'. For Fill Height between 10' and 15', T=10'.

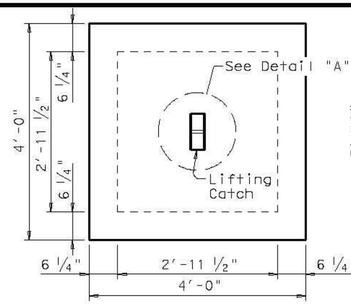


DETAIL "A"

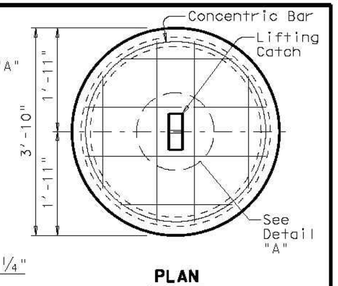


SECTION C-C

LIFTING CATCH



PLAN



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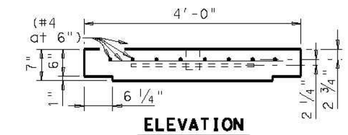
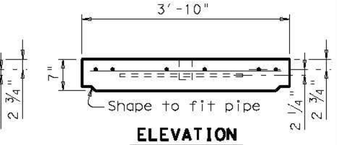


ELEVATION

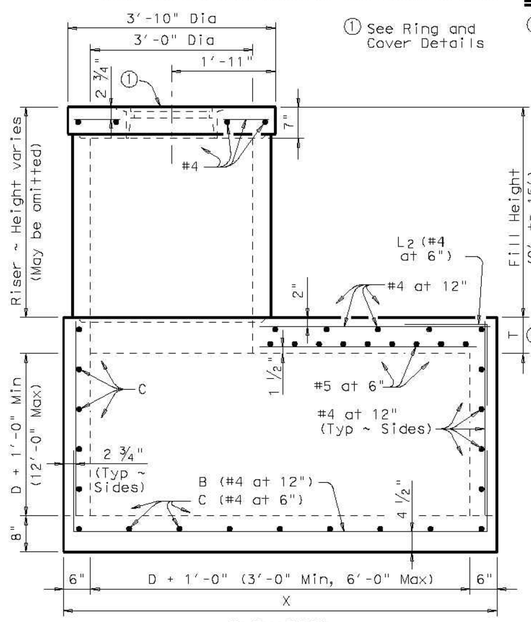
CAST-IN-PLACE RISER COVER



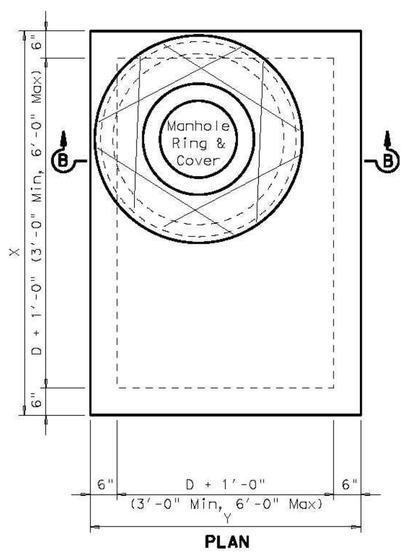
ELEVATION

CONCRETE PIPE RISER COVER

OPTIONAL PRECAST CONCRETE LIFT-OFF COVERS



ELEVATION



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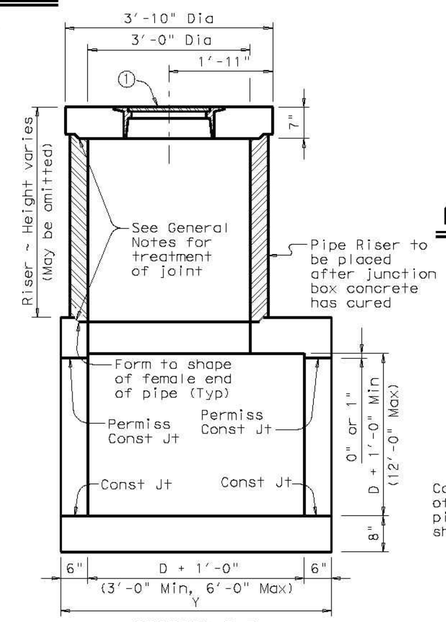
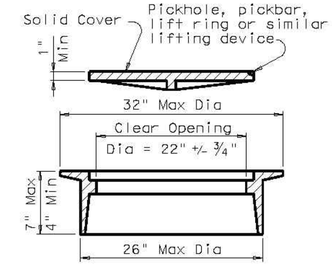


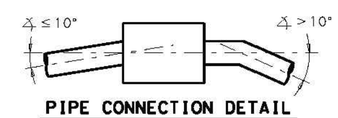
SECTION B-B

OPTIONAL MANHOLE WITH CONCRETE PIPE RISER



RING AND COVER DETAILS

Approximate Weight = 245 lb



PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

GENERAL NOTES:

Unless otherwise shown in the plans, payment will be made for each manhole of the Type M.

When approved, precast inlets with equivalent structural capacity may be furnished. Sealed engineering calculations and drawings shall be submitted for approval prior to construction.

Shop drawings will not be required.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

The riser may be constructed of reinforced concrete as shown or of Reinforced Concrete Pipe, Class III, in accordance with ASTM Designation C-76. If pipe is used, joints shall conform to the Item "Reinforced Concrete Pipe Culverts". Precast Concrete Lift-Off Cover may be substituted for Ring and Cover.

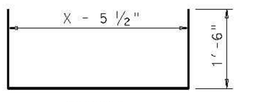
The riser, either cast-in-place or concrete pipe, may be located in any corner.

All reinforcing steel shall be #4 unless otherwise noted.

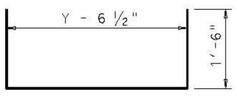
Pipes may enter any or all walls. The maximum size of pipe that can be accommodated is 60". More than one pipe may enter a side, subject to the maximum box dimension shown. The clear distance between adjacent pipes should be 9" minimum.

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

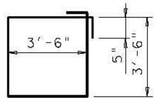
All concrete shall be Class "A" (f'c = 3000 psi).



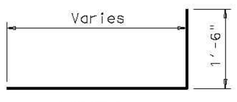
BARS B



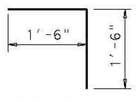
BARS C



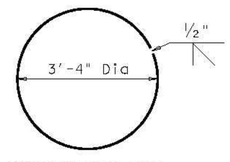
BARS D



BARS L1



BARS L2



CONCENTRIC BAR

LENTZ ENGINEERING
5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net

Texas Department of Transportation
Bridge Division

MANHOLE TYPE M
(JUNCTION BOX WITH ACCESS)
15' MAX FILL

MH-M

FILE: mh-mstde.dgn	DN: TxDOT	CK: TER	DW: MCB	CK: TER/GAF
© TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS				
	COUNTY	CONTROL	SECT	JOB	HIGHWAY

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ACC:

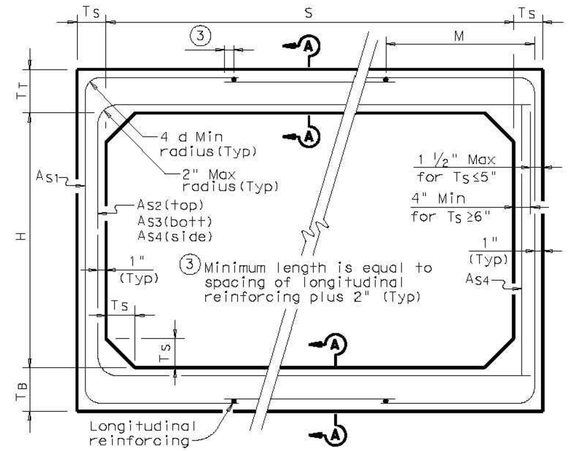
LEVELS DISPLAYED

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (in²/ft) ②								Lift Weight (Tons) ①
S (ft)	H (ft)	T_T (in)	T_B (in)	T_S (in)	(ft)	(in)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}	
6	3	8	7	7	<2	-	0.20	0.31	0.22	0.17	0.19	0.19	0.19	0.17	7.9
6	3	7	7	7	2<3	43	0.21	0.24	0.19	0.17	-	-	-	-	7.5
6	3	7	7	7	3-5	39	0.17	0.18	0.17	0.17	-	-	-	-	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	-	-	-	-	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	-	-	-	-	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	-	-	-	-	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	-	-	-	-	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	-	-	-	-	7.5
6	4	8	7	7	<2	-	0.19	0.34	0.25	0.17	0.19	0.19	0.19	0.17	8.6
6	4	7	7	7	2<3	43	0.19	0.27	0.21	0.17	-	-	-	-	8.2
6	4	7	7	7	3-5	39	0.17	0.21	0.19	0.17	-	-	-	-	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	-	-	-	-	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	-	-	-	-	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	-	-	-	-	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	-	-	-	-	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	-	-	-	-	8.2
6	5	8	7	7	<2	-	0.19	0.37	0.28	0.17	0.19	0.19	0.19	0.17	9.3
6	5	7	7	7	2<3	43	0.17	0.30	0.24	0.17	-	-	-	-	8.9
6	5	7	7	7	3-5	43	0.17	0.23	0.21	0.17	-	-	-	-	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	-	-	-	-	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	-	-	-	-	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	-	-	-	-	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	-	-	-	-	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	-	-	-	-	8.9
6	6	8	7	7	<2	-	0.19	0.38	0.30	0.17	0.19	0.19	0.19	0.17	10.0
6	6	7	7	7	2<3	52	0.17	0.32	0.26	0.17	-	-	-	-	9.6
6	6	7	7	7	3-5	52	0.17	0.24	0.22	0.17	-	-	-	-	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	-	-	-	-	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	-	-	-	-	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	-	-	-	-	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	-	-	-	-	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	-	-	-	-	9.6

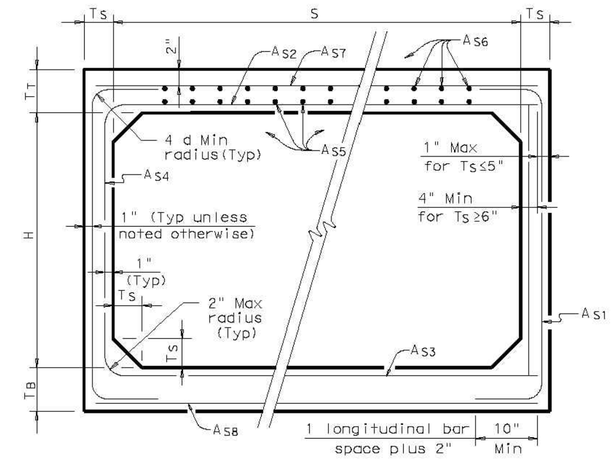
① For Box Length = 8'-0"

② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S6} and A_{S5} are minimum required areas of reinforcement per linear foot of box width.



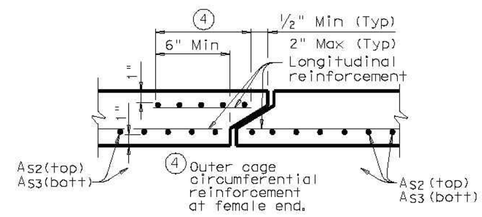
CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:

Designs shown conform to ASTM C1577.

Refer to ASTM C1577 for information or details not shown.

All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.

See SCP-MD standard sheet for miscellaneous details and notes not shown.

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BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
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LENTZ ENGINEERING

Texas Department of Transportation
Bridge Division

SINGLE BOX CULVERTS PRECAST
6'-0" SPAN

SCP-6

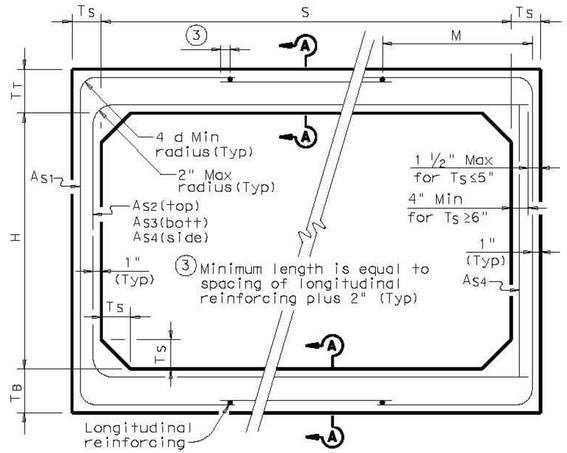
FILE: scp06ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF	
©TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT			SHEET
REVISIONS					
	COUNTY		CONTROL	SECT	JOB	HIGHWAY

BOX DATA

SECTION DIMENSIONS S (ft)	H (ft)	T_T (in)	T_B (in)	T_S (in)	Fill Height (ft)	M (Min) (in)	REINFORCING (in^2/ft) ② A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}	① Lift Weight (Tons)
8	4	8	8	8	<2	-	0.27	0.38	0.29	0.19	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2<3	50	0.31	0.34	0.32	0.19	-	-	-	-	11.2
8	4	8	8	8	3-5	50	0.25	0.27	0.27	0.19	-	-	-	-	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	-	-	-	-	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	-	-	-	-	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	-	-	-	-	11.2
8	5	8	8	8	<2	-	0.24	0.40	0.32	0.19	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2<3	50	0.28	0.37	0.35	0.19	-	-	-	-	12.0
8	5	8	8	8	3-5	45	0.23	0.29	0.30	0.19	-	-	-	-	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	-	-	-	-	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	-	-	-	-	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	-	-	-	-	12.0
8	6	8	8	8	<2	-	0.22	0.42	0.35	0.19	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2<3	50	0.25	0.40	0.38	0.19	-	-	-	-	12.8
8	6	8	8	8	3-5	50	0.21	0.32	0.33	0.19	-	-	-	-	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	-	-	-	-	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	-	-	-	-	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	-	-	-	-	12.8
8	7	8	8	8	<2	-	0.20	0.44	0.37	0.19	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2<3	55	0.23	0.43	0.41	0.19	-	-	-	-	13.6
8	7	8	8	8	3-5	55	0.19	0.34	0.35	0.19	-	-	-	-	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	-	-	-	-	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	-	-	-	-	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	-	-	-	-	13.6
8	8	8	8	8	<2	-	0.20	0.45	0.40	0.19	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2<3	65	0.21	0.45	0.44	0.19	-	-	-	-	14.4
8	8	8	8	8	3-5	65	0.19	0.36	0.38	0.19	-	-	-	-	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	-	-	-	-	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	-	-	-	-	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	-	-	-	-	14.4

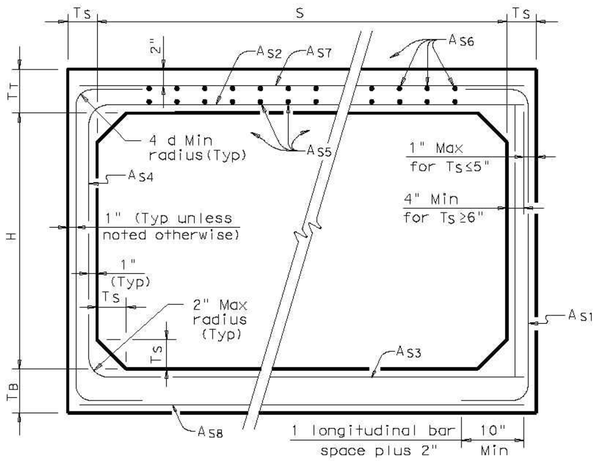
① For Box Length = 8'-0"

② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S6} and A_{S5} are minimum required areas of reinforcement per linear foot of box width.



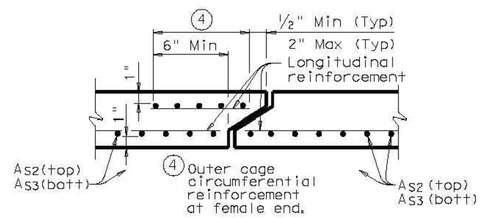
CORNER OPTION "A" **CORNER OPTION "B"**

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" **CORNER OPTION "B"**

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:

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5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net

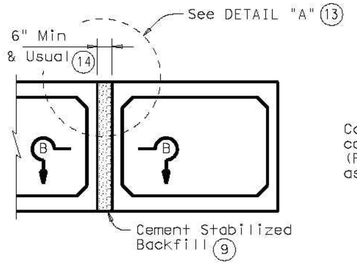
Texas Department of Transportation
Bridge Division

SINGLE BOX CULVERTS PRECAST

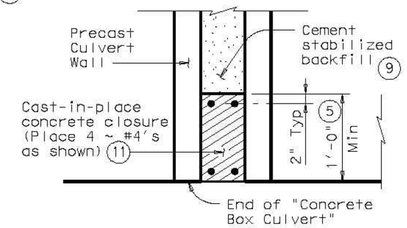
8'-0" SPAN

SCP-8

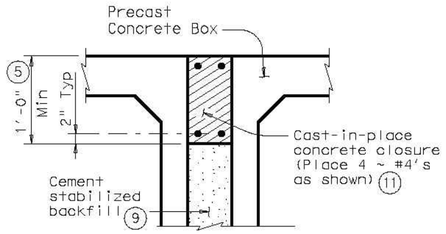
FILE: scp08ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS				
	COUNTY	CONTROL	SECT	JOB	HIGHWAY



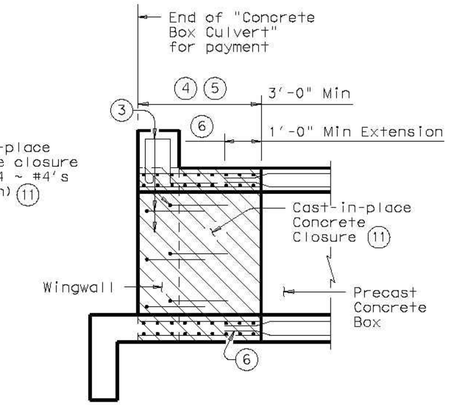
MULTIPLE UNIT PLACEMENT



SECTION B-B

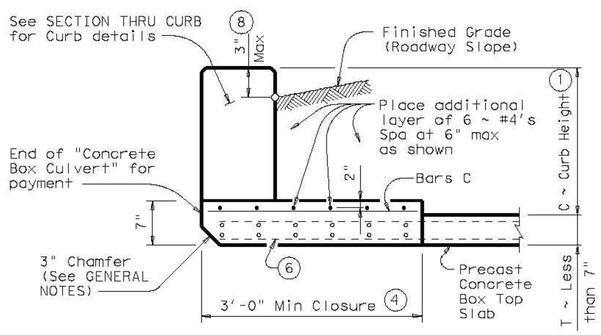


DETAIL "A" (13)

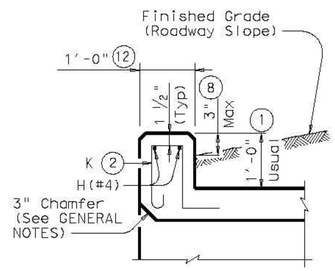


WINGWALL CONNECTION

(Also applies to Safety End Treatment)

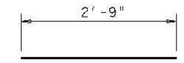


SECTION THRU TOP SLABS LESS THAN 7"

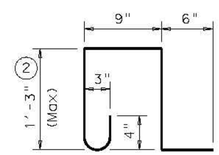


SECTION THRU CURB

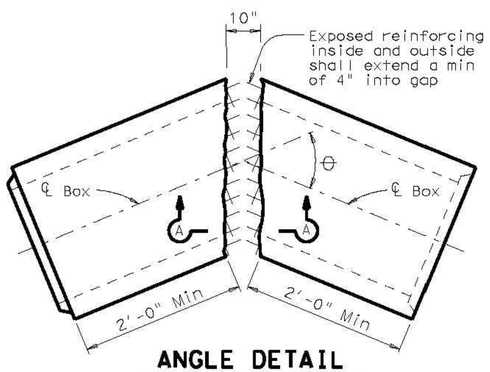
(10) QUANTITIES PER FOOT OF CURB	
Reinforcing Steel	4.18 LB
Concrete	0.037 CY



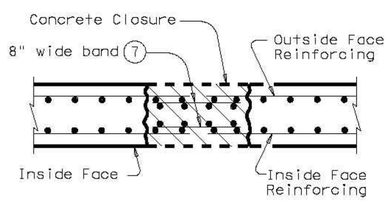
BARS C ~ #4
(Spa = 1'-0" Max)



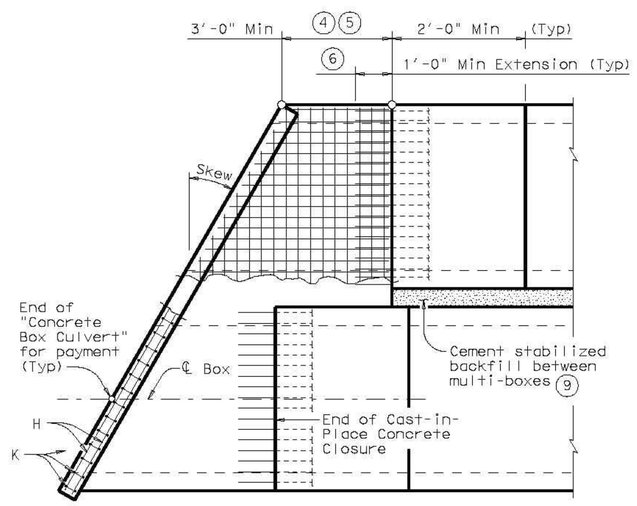
BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement)

(1) 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 traffic rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

(2) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(3) Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

(4) Cast-in-place concrete closure shall be 3'-0" min. Boxes shall be cast short or broken back in the field. All reinforcing in the closure shall be the same size and spacing as in the precast box section. Except where shown otherwise, the cast-in-place closure shall be flush with the inside and outside faces of the precast box section.

(5) For multiple unit placements the length of the closure for the interior walls may be adjusted as necessary. The length of the top slab, bottom slab, and exterior wall closure shall not be less than 3'-0". See Section B-B detail when interior walls are cast full length.

(6) Precast box reinforcing shall extend a minimum of 1'-0" into concrete closure (Typ).

(7) Bands of reinforcing matching the inside and outside face reinforcing shall be placed in the gaps of the top and bottom slabs. A band matching the outside face reinforcing of the wall shall be placed in the gaps of the walls (placed in the outside face only). The bands shall be tack welded to the exposed reinforcing at each point of contact.

(8) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with bridge rail, curbs shall be flush with finished grade.

Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) Cement Stabilized Backfill between boxes is considered part of the Box Culvert for payment.

(10) All curb concrete and reinforcing is considered part of the Box Culvert for payment.

(11) Any additional concrete and reinforcing required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

(12) 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

(13) For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in DETAIL "A".

(14) This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

All closure concrete shall be Class "C" with a minimum compressive strength of 3600 psi and shall be placed according to the Item, "Concrete Structures".

Any additional concrete required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

Refer to the Single Box Culverts Precast standard for details not shown.

The bottom edge of the top slab closure shall be chamfered 3 inches at the entrance.

HL93 LOADING

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

ACC:

LEVELS DISPLAYED

1.

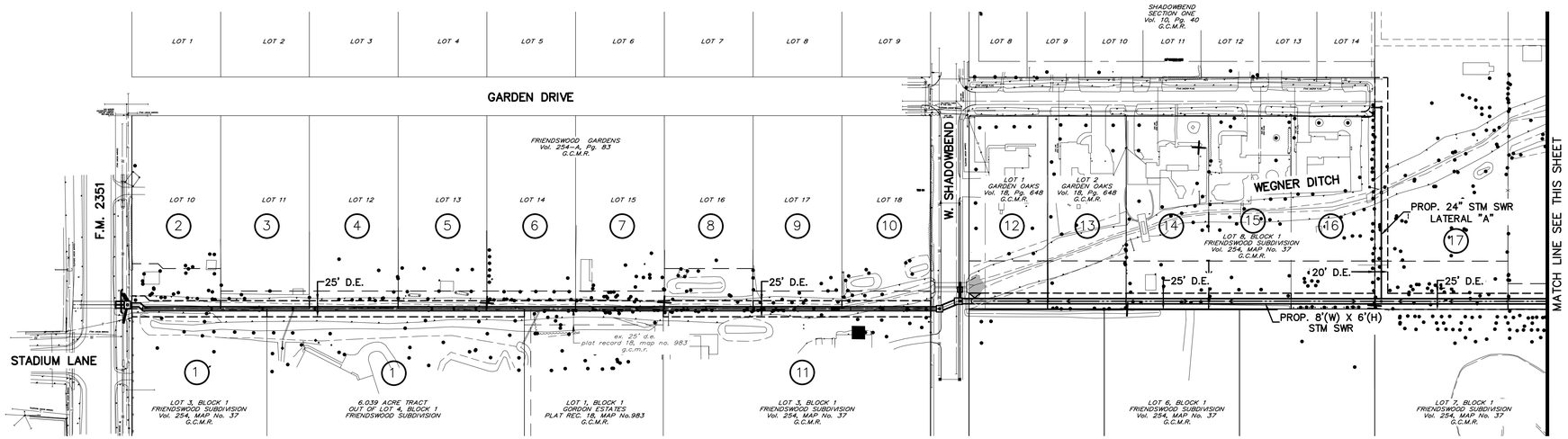
LENTZ ENGINEERING
5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net

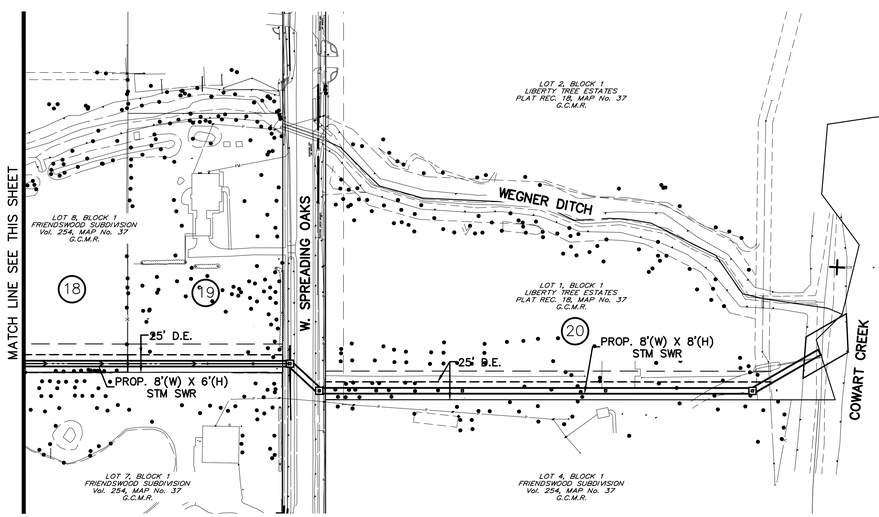
Texas Department of Transportation
Bridge Division

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS				
	COUNTY	CONTROL	SECT	JOB	HIGHWAY





Coward Creek Tributary II
Easement Index
LE-13092

Easement Number	Owner Name	Easement Description	Status	Recording Information
1	Michael A. Wegner, ET AL.	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016063638
2	Frank F. Descant, Jr., ET UX.	Drainage Easement Non Uniform Width and 50' Temporary Construction Easement	Recorded	2011036034
3	Tom Westrum	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2017006083
4	Timothy Wayne Philips and Mary Munoz Philips	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016078309
5	Mona Lee Dudley aka Mona Lee King	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016046311
6	John C. Martin and Alinda R. Martin	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	PL1643603
7	Walter C. Bradshaw, ET AL.	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2017007102
8	Charles Gergory Evans	12.5' Drainage Easement and 50' Temporary Construction Easement	Recorded	2013050953
9	Steven C. Pate	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2017023419
10	William Scott Zrubek, ET AL.	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016048821
11	Dick Daugird, ET AL.	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016046325
12	One Mae Worden	25' Drainage Easement and 50' Temporary Construction Easement with Abandonment of Existing 60' Drainage Easement	Recorded	2011052258
13	John S. Hull, ET UX.	25' Drainage Easement and 50' Temporary Construction Easement with Abandonment of Existing 60' Drainage Easement	Recorded	2012013456
14	Casey G Nilane, ET UX	25' Drainage Easement and 50' Temporary Construction Easement with Abandonment of Existing 60' Drainage Easement	Recorded	2011050806
15	John F. Burdick, ET UX	25' Drainage Easement and 50' Temporary Construction Easement with Abandonment of Existing 60' Drainage Easement	Recorded	2011047659
16	Phillip S. Stanch, ET UX	25' Drainage Easement and 50' Temporary Construction Easement with Abandonment of Existing 60' Drainage Easement	Recorded	2012014160
17	Angelo Caltabiano, ET UX.	20' Side Drainage Easement, 25' Rear Drainage Easement and 50' Temporary Construction Easement	Recorded	2011052259
18	R.L. Bockart, ET UX.	25' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016064751
19	Darrell M. Bolding, ET UX.	25' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016070056
20	Gerald Cooney, ET AL.	25' Drainage Easement and 10' Temporary Construction Easement	Recorded	2017029314
21	Timothy Wayne Philips, ET UX.	12.5 Drainage Easement and 10' Temporary Construction Easement	Recorded	2016078309
22	Wilmington Savings Fund Society, FSB, d/b/a Christian Trust, not individually but as trustee for Pretium Mortgage Acquisition	12.5' Drainage Easement and 10' Temporary Construction Easement	Recorded	2017023419
23	Robert S. Miller, ET AL.	25' Drainage Easement and 10' Temporary Construction Easement	Recorded	2016070056

CONTROL BENCHMARK: ELEV. 29.65
H.G.C.S.D. IRON ROD 54 LOCATED APPROX. 83.4' SOUTHEAST OFF EDGE ROAD (F.M. 528) AND 3' SOUTHWEST OF BACK OF CURB OF CLEAR CREEK DRAINAGE DISTRICT PARKING LOT.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S1 ELEV. 25.42
CHISELED SQUARE ON C INLET ON NORTH CORNER OF SUNSET DRIVE AND WEST SPREADING OAKS.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S2 ELEV. 27.81
CHISELED SQUARE ON C INLET LOCATED APPROXIMATELY 98 FEET NORTHWEST OF THE INTERSECTION OF SUNSET DRIVE AND WEST SHADOWBEND.
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S3 ELEV. 26.40
RAILROAD SPIKE IN ASPHALT LOCATED AT THE NORTHWEST CORNER OF WEST SPREADING OAKS AND SEDORA DRIVE
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S4 ELEV. 27.88
CHISELED SQUARE ON C INLET LOCATED APPROXIMATELY 165 FEET SOUTHWEST OF THE INTERSECTION OF GARDEN DRIVE AND WEST SHADOWBEND. (EXACT LOCATION SHOWN ON SURVEY)
(H.G.C.S.D. 1987 ADJUSTMENT)

T.B.M.–S5 ELEV. 30.89
RAILROAD SPIKE IN ASPHALT LOCATED AT THE NORTHWEST CORNER OF THE INTERSECTION OF F.M. 2351 AND STADIUM LANE. (EXACT LOCATION SHOWN ON SURVEY)
(H.G.C.S.D. 1987 ADJUSTMENT)

FLOOD STATEMENT:
AS PER FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP NO. 48546B005E DATED 09–22–99. THE MAJORITY OF THIS SITE IS LOCATED IN ZONE "X" FOR AREAS DETERMINED TO BE OUTSIDE THE 100 YEAR FLOOD PLAIN. THE WORK IN THE IMMEDIATE VICINITY OF COWART CREEK MAY BE IN THE 100–YEAR FLOOD PLAIN AND/OR FLOODWAY.

100 0 100 200
SCALE: 1" = 100'

FRIENDSWOOD TEXAS

MORAD KABIRI, P.E., AICP DATE
DIRECTOR OF COMMUNITY DEVELOPMENT

KAZ HAMIDIAN DATE
DIRECTOR OF PUBLIC WORKS

NOTE:
THIS IS TO CERTIFY THAT THE ABOVE SIGNED HAVE REVIEWED ALL SHEETS PROVIDED AND FOUND THEM TO BE IN GENERAL COMPLIANCE WITH THE REQUIREMENTS ESTABLISHED BY THE CITY OF FRIENDSWOOD. THIS APPROVAL IS ONLY VALID FOR THREE HUNDRED SIXTY–FIVE (365) DAYS FROM THE DATE OF THE ENGINEER'S SIGNATURE. THE DESIGN AND ALL CALCULATIONS PROVIDED IN THE PLANS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THE PLANS SUBMITTED HAVE BEEN PREPARED, SIGNED AND SEALED BY A PROFESSINAL ENGINEER LICENSED TO PRACTICE ENGINEERING N THE STATE OF TEXAS, WHICH CONVEYS THE ENGINEER'S RESPOPNSIBILITY AND ACCOUNTABILITY.

NO.	DATE	REVISIONS	APP.
1	7/5/16	ACCESS POINT	J.D.A.

THIS DOCUMENT AND RELATED DETAILS REMAIN THE PROPERTY OF LENTZ ENGINEERING, LC. THIS DOCUMENT IS NOT TO BE SOLD, COPIED, OR REPRODUCED WHOLE OR IN PART, WITHOUT THE CONSENT OF LENTZ ENGINEERING, LC.

LENTZ ENGINEERING
5909 WEST LOOP SOUTH, SUITE 200
BELLAIRE, TEXAS 77401
PHONE : 713.839.8900
FAX : 713.839.9020
TBPE REGISTRATION No. F-001378
www.lentzengineering.net

COWARD CREEK – TRIBUTARY II
CITY OF FRIENDSWOOD,
GALVESTON COUNTY, TEXAS

EXHIBIT OF EASEMENTS

STATE OF TEXAS
JARROD D. ADEN
92955
LICENSED
PROFESSIONAL ENGINEER
6/26/17

DRAWN BY: B.S.M.	JOB NO.: LE–13092	SHEET	21
DESIGNED BY: J.D.A.	DATE: JUNE, 2017		
APPROVED BY: J.D.A.	SCALE: 1" = 100'		

F:\Data\2013\13092 CDBG – TRIBUTARY II\Lentz\13092MASTER.dwg June 26, 2017 7:43:07 AM Rudy De Hayos

GALVESTON COUNTY
PURCHASING DEPARTMENT

REQUEST FOR PROPOSAL

RFP #B171023

CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT

PROPOSAL DUE DATE: 09/14/2017

2:00 P.M.

Rufus Crowder, CPPO, CPPB
Purchasing Agent
Galveston County
722 Moody (21st Street)
Fifth (5th) Floor
Galveston, Texas 77550
(409) 770-5372

RFP #B171023
OPENING: 09/14/2017
TIME: 2:00 P.M.

REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

Sealed proposals in **sets of five (5), one (1) original and four (4) copies,** will be received in the office of the Galveston County Purchasing Agent **until 2:00 P.M. CST, on Thursday, September 14, 2017** and opened immediately in that office in the presence of Galveston County Auditor and the Purchasing Agent. Sealed qualifications are to be delivered to Rufus G. Crowder, CPPO CPPB, Galveston County Purchasing Agent at the Galveston County Courthouse, 722 Moody, (21st Street), Floor 5, Purchasing, Galveston, Texas 77550, (409) 770-5372. **The time stamp clock located in the Purchasing Agent's office shall serve as the official time keeping piece for this solicitation process. Any proposal received after 2:00 P.M., CST on the specified date will be returned unopened.**

Purpose:
Galveston County is soliciting proposals for a drainage improvement project from FM-2351 to Cowart Creek.

All proposals must be marked on the outside of the envelope:
RFP #B171023
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT

Proposer's name, return address, should be prominently displayed on the proposal package for identification purposes.

Specifications can be obtained at the office of the Galveston County Purchasing Agent, located in the Galveston County Courthouse, 722 Moody, (21st Street), Floor 5, Purchasing, Galveston, Texas, 77550, or by visiting the Galveston County website @ http://www.galvestoncountytx.gov/pu/Pages/BidListings.aspx.

Submitted prices shall be either lump sum or unit prices as shown on proposal sheets, if applicable. The net price shall be delivered to Galveston County, including all freight, shipping, and license fees. Galveston County is tax exempt and no taxes should be included in proposal pricing.

A non-mandatory pre-proposal conference will be held on Wednesday, August 23, 2017 at 2:00 P.M. at the Galveston County Consolidated Drainage District, 1605 Whitaker Dr., Friendswood, TX 77546.

Plans and specifications may be obtained from the office of the Engineer at 5909 West Loop S #200a, Bellaire, TX 77401 upon a **NON-REFUNDABLE** payment of Fifty dollars ($50.00) for each set or provided free of charge in electronic format (PDF) on CD or DVD. Copies of proposal/Contract Documents may also be obtained from www.CivcastUSA.com search Galveston County Cowart Creek. Proposers must register on this website in order to view and/or download specifications and plans for this project. There is NO charge to view or download documents. If copies of the bidding documents are to be mailed, please contact Lentz Engineering, LLC. for postage and handling. Return of documents is not required and no refund will be granted.

Upon satisfaction of contractual terms (e.g., goods delivered in promised condition, services rendered as agreed, etc.), contractor shall be paid via Galveston County's normal accounts payable process.

Bonding Requirements:

- **PROPOSAL GUARANTEE:** Evidencing its firm commitment to engage in the contract if Proposer is selected for award of contract, each Proposer is required to furnish with their proposal a Cashier's Check, or an acceptable Proposer's Bond (in the event of requests for bids, this is called a Bidder's Bond), in the amount of five percent (5%) of the total contract price. The Proposer's Bond must be executed with a surety company authorized to do business in the State of Texas. Failure to furnish the bid/proposal guarantee in the proper form and amount, by the time set for opening of proposals may be cause or rejection of the proposal.

- **PERFORMANCE AND PAYMENT BONDS:**
  Successful proposer, before beginning work, shall execute a performance bond and a payment bond, each of which must be in the amount of the contract. The required payment and performance bonds must each be executed by a corporate surety in accordance with Section 1, Chapter 87, Acts of the 56th Legislature, Regular Session, 1959 (Article 7.19-1, Vernon's Texas Insurance Code).

Attention is called to the fact that not less than, the federally determined prevailing (Davis-Bacon and Related Acts) wage rate, as issued by the Office of Rural Community Affairs and contained in the contract documents, must be paid on this project. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex age or national origin.

The Galveston County Commissioners' Court reserves the right to waive any informality and to reject any and all proposals and to accept the proposal or proposals which, in its opinion, is most advantageous to Galveston County with total respect the governing laws.

All contractors/subcontractors that are debarred, suspended or otherwise excluded from or ineligible for participation on federal assistance programs may not undertake any activity in part or in full under this project

Rufus G. Crowder, CPPO CPPB
Purchasing Agent
Galveston County

RFP #B171023
OPEN: 09/14/2017
TIME: 2:00 P.M.

REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

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REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

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REQUEST FOR PROPOSAL
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GALVESTON COUNTY, TEXAS

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GENERAL PROVISIONS – REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

1. PROPOSAL PACKAGE

The Request for Proposal, general and special provisions, drawings, specifications/line item details, contract documents, addenda (if any), and the Proposal are all part of the Proposal package. ***PROPOSALS must be submitted in sets of five (5), one (1) original and four (4) copies*** *on the forms provided by the County if County forms are provided, and shall include the Proposal sheets completed in their entirety and signed by an authorized representative by original signature. Failure to complete and sign the proposal sheets/contract page(s) may disqualify the proposal from being considered by the Commissioners Court. Any individual signing on behalf of the Proposer expressly affirms that he or she is duly authorized to tender this proposal and to sign the proposal under the terms and conditions in this request for proposal on behalf of the Proposer and to bind the Proposer to the terms and conditions of this request for proposal and the Proposer's response hereto. Proposer further understands that Proposers' signing of the contract shall be of no effect unless the contract is subsequently awarded by the Commissioners Court and the contract properly executed by the Commissioners Court. All figures must be written in ink or typed. Figures written in pencil or with erasures are not acceptable. However, mistakes may be crossed out, corrections inserted, and initialed in ink by the individual signing the bid. If there are discrepancies between unit prices quoted and extensions, the unit price shall prevail. Each Proposer is required to thoroughly review this entire request for proposal package to familiarize themselves with the proposal procedures, the plans and specifications for the requested work, as well as the terms and conditions of the contract the successful Proposer will execute with the County.*

2. PROPOSER'S RESPONSIBILITY

The Proposer must affirmatively demonstrate its responsibility. The Proposer must also meet the following minimum requirements:

A. have adequate financial resources or the ability to obtain such resources as required;
B. be able to comply with all federal, state, and local laws, rules, regulations, ordinances and orders regarding this request for proposal;
C. have a satisfactory record of performance;
D. have a satisfactory record of integrity and ethics; and
E. be otherwise qualified and eligible to receive an award.

3. TIME FOR RECEIVING PROPOSALS

Proposals may be submitted by mail or hand delivery and **must be submitted only to the Galveston County Purchasing Agent**. If by delivery, the Proposer must deliver the Proposal to the reception desk in the County Purchasing Agent's Office. The delivery and mailing instructions for the Galveston Count Purchasing Agent are the following:

Rufus Crowder, CPPO CPPB
Galveston County Purchasing Agent
722 Moody, Fifth (5th) Floor
Galveston, Texas 77550

GENERAL PROVISIONS – REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

Proposals will **not** be accepted by facsimile transmission or by electronic mail (email) unless superseded by instructions within the Special Provisions sections of this solicitation. Proposals must be received by the County Purchasing Agent on or before the deadline for the opening of the proposals. For clarity, mailing date/postmark is **not** sufficient – proposals **must be received** by the County Purchasing Agent on or before the deadline. Late proposals will not be accepted and will be returned to the proposer unopened. Proposals received prior to the submission deadline will be maintained unopened until the specified time for opening.

The County Purchasing Agent will accept proposals from 8:00 a.m. to 5:00 p.m. on each business day up to the submission deadline. Business days do not include Saturdays and Sundays, and do not include other days in which the County is closed for business in observance of holidays or for other reasons.

The time-stamp clock within the County Purchasing Agent's Office shall be the official time-clock for the purpose of this solicitation and thus shall be the determinant of whether the proposal was timely received.

The proposer should prominently identify the procurement number and name on the outside of the envelope/mailing package. A label shall be provided for this purpose and usage of the label is preferred. If the proposer fails to identify the request for proposal number and name on the outside of the envelope as required, the Purchasing Agent will open the envelope for the sole purpose of identifying the solicitation number for which the submission was made. The envelope will then be resealed. No liability will attach to a County office or employee for the premature opening of a proposal.

If a proposal is not submitted, return this Request for Proposal and state reason (s), otherwise your name may be removed from the Purchasing Agent's mailing list.

4. COMPETITIVENESS, INTEGRITY, INQUIRIES AND QUESTIONS

To prevent biased evaluations and to preserve the competitiveness and integrity of the procurement process, **proposers are to direct all communications regarding this invitation to bid only to the Galveston County Purchasing Agent,** unless otherwise specifically noted.

Do not contact the requesting department. Attempts by offering firms to circumvent this requirement will be viewed negatively and may result in rejection of the proposal of the firm found to be in non-compliance.

All questions regarding this Request for Proposal must be submitted in writing to:

Rufus Crowder, CPPO CPPB, Purchasing Agent
722 Moody
Fifth (5th) Floor
Galveston, Texas 77550
Fax: (409) 621-7997
E-mail: rufus.crowder@co.galveston.tx.us

All questions received and the responses thereto will be mailed, emailed, or faxed to all prospective proposers by addendum. No inquiries except clarification of instructions will be addressed by telephone.

Proposer is advised to carefully review this Request for Proposal – it provides specific information necessary to aid participating firms in formulating a thorough response. Proposer's failure to examine all documents shall not entitle the proposer to any relief from the conditions imposing in the Request for Proposal and the resultant contract.

GENERAL PROVISIONS – REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

An authorized person from the proposer must sign the proposal. This signatory must be a person from the submitting firm who is duly authorized to tender and sign the proposal on behalf of the proposer and to bind the proposer to the terms and conditions of this Request for Proposal, the proposer's response, and all other terms and conditions of the contract. By this signature, the proposer further acknowledges that the proposer has read the request for proposal and proposal documents thoroughly before submitting a proposal and will fulfill the obligations in accordance to the terms, conditions, and specifications detailed herein.

5. PROPOSAL OPENING

The Purchasing Agent shall open the proposals on the date and time specified herein. Only the names of the proposers will be read at the opening. Proposals shall be opened in a manner that avoids disclosure of the contents to competing offerors and that keeps the proposals secret during negotiations. The Purchasing Agent will examine proposals promptly and thoroughly. Upon opening, no proposal may be withdrawn for a period of sixty (60) calendars days after the proposal opening date.

6. WITHDRAWAL OF PROPOSAL/FIRM BID RULE

Proposers may request withdrawal of their sealed proposal prior to the scheduled proposal opening time provided the request for withdrawal is submitted to the Purchasing Agent in writing. No proposals may be withdrawn for a period of sixty (60) calendar days after opening of the proposals.

7. COMMISSIONERS COURT

No contract is binding on the County until it is properly placed on the Commissioners Court agenda, approved in open Court, authorized to be executed by the County Judge, and fully executed by both parties.

Department heads and elected officials are not authorized to enter into any type of agreement or contract on behalf of the County. Only the Commissioners Court acting as a body may enter into a contract on behalf of and contractually bind the County. Additionally, department heads and elected officials are not authorized to agree to any type of supplemental agreements or contracts for goods or services. Supplemental agreements are subject to review by the County Legal Department prior to being accepted and signed by the County's authorized representative.

8. REJECTION OF PROPOSALS/DISQUALIFICATION

Galveston County, acting through its Commissioners Court, reserves the right to:

- reject any and all proposals in whole or in part received by reason of this request for proposal;
- waive any informality in the proposals received;
- disregard the proposal of any proposer determined to be not responsible;
- disregard the proposal of any proposer determined to have not submitted its proposal timely; and/or
- discontinue its efforts for any reason under this request for proposal package at any time prior to actual execution of contract by the County.

GENERAL PROVISIONS – REQUEST FOR PROPOSAL
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
GALVESTON COUNTY, TEXAS

Proposers may be disqualified and rejection of proposals may be recommended to the Commissioners Court for any of (but not limited to) the following causes:

A. Failure to use the proposal forms furnished by the County, if applicable;
B. Lack of signature by an authorized representative of proposer;
C. Failure to properly complete the proposal;
D. Failure to meet the mandatory requirements of this request for proposal; and/or
E. Evidence of collusion among proposers.

9. RESTRICTIVE OR AMBIGUOUS SPECIFICATIONS

It is the responsibility of the prospective proposer to review the entire request for proposal packet and to notify the Purchasing Agent if the specifications are formulated in a manner that would restrict competition or appear ambiguous. Any protest or question(s) regarding the specifications or proposal procedures must be received in the Purchasing Agent's Office not less than seventy-two (72) hours prior to the time set for proposal opening. Proposers are to submit their proposal as specified herein or propose an approved equal.

10. SUBSTITUTES/DESCRIPTION OF MATERIALS AND EQUIPMENT

Any brand name or manufacturer reference used herein is intended to be descriptive and not restrictive, unless otherwise noted, and is used to indicate the type and quality of material. The term "or equal" if used, identifies commercially produced items that have the essential performance and salient characteristics of the brand name stated in the item description. All supplies, material, or equipment shall be new and of the most suitable grade for the purpose intended. For clarification, "new" includes products containing recovered materials that are EPA-designated items. It is not the County's intent to discriminate against any materials or equipment of equal merit to those specified. However, if proposer desires to use any substitutions, prior written approval must be obtained from the Purchasing Agent and sufficiently in advance such that an addendum may be issued. All material supplied must be one hundred percent (100%) asbestos free. Proposer, by submission of its proposal, certifies that if awarded any portion of this procurement, the proposer will supply only material and equipment that is 100% asbestos free.

11. EXCEPTIONS TO PROPOSAL

The proposer will list on a separate sheet of paper any exceptions to the conditions of this request for proposal. This sheet will be labeled, "Exceptions to Proposal Conditions", and will be attached to the proposal. If no exceptions are stated, it will be understood that all general and special conditions will be complied with, without exception.

The proposer must specify in its proposal any alternatives it wishes to propose for consideration by the County. Each alternative should be sufficiently described and labeled within the proposal and should indicate its possible or actual advantage to the program being offered.

The County reserves the right to offer these alternatives to other proposers.

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12. PRICING

Proposals will be either lump sum or unit prices as shown on the proposal sheet. The net priced items will be delivered to Galveston County, including all freight, shipping, and delivery charges.

Cash discount must be shown on the proposal, otherwise prices will be considered net. Unless prices and all information requested are complete, the proposal may be disregarded and given no consideration.

In case of default by the contractor, the County of Galveston may procure the articles or services from other sources and may deduct from any monies due, or that may thereafter become due to the contractor, the difference between the price named in the contract of purchase order and the actual cost thereof to the County of Galveston. Prices paid by the County of Galveston shall be considered the prevailing market price at the time such purchase is made. Periods of performance may be extended if the facts as to the cause of delay justify such extension in the opinion of the Purchasing Agent and the Commissioners' Court.

13. PROCUREMENT CARD (P-CARD) PROGRAM

The County of Galveston participates in a Procurement Card (P-Card) program that allows payments made to a vendor by credit card. This method typically results in substantially faster bill payments, sometimes within three (3) to five (5) days of the actual transaction date. All transaction fees from the card provider are to be paid by the successful contractor. If your company will accept payment via credit card (Visa, MasterCard), please notate this in your Proposal submittal.

14. PASS THROUGH COST ADJUSTMENTS

Except in instances of extreme extenuating circumstances, Contractor prices shall remain firm throughout the contract period and any renewals. Examples of extreme extenuating circumstances include such situations as a nationwide rail strike, oil shortage or oil embargo.

In extreme extenuating circumstances, Contractors may be allowed to temporarily "pass through" additional costs they are forced to incur through no fault of their own. A request for a pass through cost increase will not be considered unless a Contractor's cost for the Contractor's product exceeds 10% over the original cost for the product. Also, the increase in cost must be nationwide and consistent for a minimum period of sixty (60) calendar days. Costs that historically are anticipated to rise over a period of time (for example only, such as wages or insurance costs) do not qualify for pass through. If a Contractor thinks he will be asking for a pass through cost adjustment during the term of the contract, then the original cost of the product to Contractor must be stated in Contractor's original proposal.

A request for a pass through cost does not guarantee that one will be granted. Contractors must submit such information on each request as required by the County Purchasing Agent. The County Purchasing Agent will review each request on a case-by-case basis and if valid submit the request to the Commissioners Court for authorization and determination of the appropriateness of each request as well as amount and duration of increase. Contractors will not be permitted any additional compensation for mark-ups or profits based on the increase in price. Rather, such additional compensation will be limited to the actual increase in original cost to the Contractor as such increase is reflected by the original cost stated in the bid. But in no event will the amount of additional compensation exceed 25% increase in Contractor's original cost for the product as such cost is reflected in Contractor's original proposal or the duration exceed a period of sixty (60) calendar days. In addition should the cost, during the period of the pass through, return to normal or decrease to below pre pass through prices, appropriate downward adjustments shall be made. No more than one pass through adjustment will be permitted per year.

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15. MODIFICATION OF PROPOSALS

A proposer may modify a proposal by letter at any time prior to the submission deadline for receipt of proposals. Modification requests must be received by the Purchasing Agent prior to the submission deadline. Modifications made before opening time must be initialed by proposer guaranteeing authenticity. Proposals may not be amended or altered after the official opening with the single exception that any product literature and/or supporting data required by the actual specifications, if any, will be accepted at any time prior to the Commissioners Court considering of same.

16. PRE-PROPOSAL CONFERENCE

A pre-proposal conference for the purpose of discussing contract requirements and answering questions of prospective proposers may be conducted in this procurement. A pre-proposal conference may be mandatory or voluntary. If the pre-proposal conference is mandatory, then the County is authorized to condition acceptance of a proposal on compliance with attendance. The Special Provisions of this procurement shall specify if a pre-proposal conference is to be held and shall specify whether the pre-proposal conference is mandatory or voluntary. Regardless of whether the pre-proposal conference is mandatory or voluntary, only a principal, officer, or employee of the proposer may represent the proposer at the pre-proposal conference and no person may represent more than one proposer at the pre-proposal conference.

17. SIGNATURE OF PROPOSALS

Each proposal shall give the complete name of the proposer and the mailing address of the proposer and be signed by an authorized representative by original signature with the authorized representative's name and legal title typed below the signature line. Each proposal shall include the proposer's Federal Employer Identification Number (FEIN). Failure to sign the Contract page(s) and proposal response sheets may disqualify the proposal from being considered by the County. The person signing on behalf of the proposer expressly affirms that the person is duly authorized to tender the proposal on behalf of the proposer and to sign the proposal sheets and contract under the terms and conditions of this Request for Proposal and to bind the proposer hereto and further understands that the signing of the contract shall be of no effect until it is properly placed on the Commissioners Court agenda, approved in open Court, authorized to be executed by the County Judge, and fully executed by both parties.

18. AWARD OF PROPOSALS – EVALUATION CRITERIA AND FACTORS

The award will be made to the responsible proposer whose proposal is determined to be the lowest and best evaluated offer demonstrating the best ability to fulfill the requirements set forth in this Request for Proposal. **The proposed cost to the County will be considered firm and cannot be altered after the submission deadline, unless the County invokes its right to request a best and final offer.**

"Lowest and best" means a bid or offer providing the best value considering associated direct and indirect costs, including transport, maintenance, reliability, life cycle, warranties, and customer service after a sale.

In determining the lowest and best bid for a contract for the purchase of earth-moving, material-handling, road maintenance, or construction equipment, the Commissioners Court may also consider the information submitted under Section 262.0255 of the Local Government Code; and in determining the lowest and best bid for a contract for

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the purchase of road construction material, the Commissioners Court may consider the pickup and delivery locations of the bidders and the cost to the county of delivering or hauling the material to be purchased. The Commissioners Court may award contracts for the purchase of road construction material to more than one bidder if each of the selected bidders submits the lowest and best bid for a particular location or type of material.

Each proposer, by submitting a proposal, agrees that if its' proposal is accepted by the Commissioners Court, the proposer will furnish all items and services upon which prices have been tendered and upon the terms and conditions in this proposal, including but not limited to the best and final offer if applicable, and the contract.

The contractor shall commence work only after the transmittal of a fully executed contract and after receiving written notification to proceed from the County Purchasing Agent. The contractor will perform all services indicated in the proposal in compliance with this contract.

Neither department heads nor elected officials are authorized to sign any binding contracts or agreements prior to being properly placed on the Commissioners' Court agenda and approved in open court. Department heads and other elected officials are not authorized to enter into any type of agreement or contract on behalf of Galveston County. Only the Commissioners Court, acting as a body, may enter into a contract on behalf of the County. Additionally, department heads and other elected officials are not authorized to agree to any type of supplemental agreements or contracts for goods or services. Supplemental agreements are subject to review by the County Legal Department prior to being signed by the County's authorized representatives.

The County of Galveston reserves the right to accept proposals on individual items listed, or group items, or on the proposal as a whole; to reject any and all proposals; to waive any informality in the proposals; to disregard proposals that are not submitted timely; to disregard the proposals of proposers determined to be not responsible; and to accept the proposal that appears to be in the best interest of the County. The selection process may, however, include a request for additional information or an oral presentation to support the written proposal.

In determining and evaluating the best proposal , the pricing may not necessarily be controlling, but quality, equality, efficiency, utility, general terms, delivery, suitability of the service offered, and the reputation of the service in general use will also be considered along with any other relevant items. The Commissioners Court shall be the sole judge in the determination of these matters.

The County reserves the right to reject any or all proposals in whole or in part received by reason of this Request for Proposal and may discontinue its efforts under this Request for Proposal for any reason or no reason or solely for the County's convenience at any time prior to actual execution of the contract by the County.

A Proposer whose proposal does not meet the mandatory requirements set forth in this request for proposal will be considered non-compliant.

The invitation to submit a proposal which appears in the newspaper, or other authorized advertising mediums, these general provisions, the specifications which follow, the proposal sheets, and any addenda issued are all considered part of the proposal.

Each proposer, by submitting a proposal, agrees that if its proposal is accepted by the Commissioners Court, such proposer will furnish all items and services upon the terms and conditions in this request for proposal and the resultant contract.

Notice of contract award is anticipated to be made within ninety (90) days of opening of proposals to the lowest responsive and responsible contractor, whose proposal complies with all the requirements in the request for proposal.

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Contractor shall submit to the County, for approval, within ten (10) days from notice of contract award, all Certificates of Insurance evidencing the required coverage as described under Section 37, Requirement of and Proof of Insurance, or if different, then as described within the Special Provisions or resultant contract.

The contractor shall not commence work under these terms and conditions of the contract until all applicable Purchase Orders, Certificates of Insurance, Performance and Payment Bonds, and Irrevocable Letters of Credit (if required) have been approved by the County of Galveston and the Contractor has received notice to proceed in writing and an executed copy of the contract from the County Purchasing Agent.

19. DISPUTE AFTER AWARD/PROTEST

Any actual or prospective Proposer who is allegedly aggrieved in connection with this procurement or award of a contract resulting therefrom may protest. The protest shall be submitted in writing to the Purchasing Agent within seven (7) calendar days after such aggrieved person knows of or should have known of the facts giving rise thereto. If the protest is not resolved by mutual agreement, the Purchasing Agent will promptly issue a decision in writing to the protestant. If the protestant wishes to appeal the decision rendered by the Purchasing Agent, such appeal must be made to the Commissioners Court through the Purchasing Agent. The decision of the Commissioners Court will be final. The Commissioners Court need not consider protests unless this procedure is followed.

20. PUBLIC INFORMATION ACT (f/k/a Open Records Act)

The proposer acknowledges that the County is a government body for purposes of the Public Information Act, codified as Chapter 552 of the Texas Government Code, and as such is required to release information in accordance with the provisions of the Public Information Act.

If proposer considers any of its submitted information to be proprietary in nature, trade secret, or otherwise confidential, then it must clearly and conspicuously mark such information as proprietary, trade, secret, or confidential. By the submission of its proposal, proposer expressly affirms that it has clearly and conspicuously marked any information within its submission that proposer considers confidential, proprietary, and/or trade secret.

In the event the County receives a request for information under the Public Information Act seeking information that the proposer has marked as confidential, proprietary, and /or trade secret, then the County agrees that it shall provide notice to the proposer of the request for information and the request for decision process under the Public Information Act. Thus, the County will submit the initial correspondence to the Texas Attorney General – however, the burden is and shall be on the proposer to submit correspondence to the Attorney General if the proposer wishes its information to be withheld. Proposer is deemed to have knowledge of the Public Information Act. **By the submission of its proposal, proposer expressly acknowledges that the burden to withhold its' information from public disclosure lays with the proposer;** thus, proposer further acknowledges and agrees that it shall submit comments to the Texas Attorney General in the request for decision process if proposer wishes to have its' information withheld from public disclosure.

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21. PROPOSER'S E-MAIL ADDRESSES – CONSENT TO DISCLOSURE

Notwithstanding the foregoing Section 20, proposer acknowledges and agrees that the confidentiality of any and all email addresses proposer uses or discloses in communicating with the County are **open** to the public in accordance with Section 552.137 of the Government Code and proposer consents to the release of its email addresses.

22. RESULTANT CONTRACT

Proposer shall correctly and fully execute the resultant contract first. After this, the contract shall be set for consideration by the Commissioners Court. If the Commissioners Court authorizes the execution of the contract, the resultant contract shall become effective upon the Commissioners Court execution of same, provided that the contract is executed by all parties to the contract. Contract documents shall consist of the contract, the General and Special Provisions, drawings, proposal package (including best and final offer(s) if such is utilized), any addenda issued, and any change orders issued during the work. If applicable to the attached proposal, proposer must sign three (3) original contracts and return all three with their proposal submittal.

Proposer should submit a proposed contract with its proposal or its sample material terms and conditions for review and consideration.

23. CONTRACT TERM

The term of the resultant contract will begin on the date of full execution or the execution by the Commissioners Court, whichever is later, and will terminate on the date specified in the resultant contract unless terminated earlier as herein set forth.

24. TERMINATION FOR DEFAULT

Failure of either party in the performance of any of the provisions of this contract shall constitute a breach of contract, in which case either party may require corrective action within ten (10) business days from date of receipt of written notice citing the exact nature of such breach. Failure of the party being notified to take corrective action within the prescribed ten (10) business days, or failure to provide written reply of why no breach has occurred, shall constitute a Default of Contract.

All notices relating to default by proposer of the provisions of the contract shall be issued by the County through its Legal Department, and all replies shall be made in writing to the County Legal Department. Notices issued by or issued to anyone other than the County Legal Department shall be null and void and shall be considered as not having been issued or received.

Galveston County reserves the right to enforce the performance of this contract in any manner prescribed by law in the event of breach or default of this contract, and may contract with another party, with or without solicitation of proposals or further negotiations. At a minimum, proposer shall be required to pay any difference in service or materials, should it become necessary to contract with another source, plus reasonable administrative costs and attorney fees.

In the event of Termination for Default, Galveston County, its agents or representatives shall not be liable for loss of any profits anticipated to be made by proposer.

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In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

No waiver by either party of any event of default under this agreement shall operate as a waiver of any subsequent default under the terms of this agreement.

County reserves the right to terminate this contract immediately in the event proposer:

A. Fails to meet delivery or completion schedules; and/or
B. Fails to otherwise perform in accordance with the accepted proposal and the contract.

25. TERMINATION FOR CONVENIENCE

County may terminate this contract upon at least thirty (30) calendar days prior written notice for its convenience or for any reason deemed by the County to serve the public interest. As well, County may terminate this contract upon thirty (30) calendar days prior written notice for any reason resulting from any governmental law, order, ordinance, regulation, or court order. In no event shall County be liable for loss of any profits anticipated to be made hereunder by proposer should this contract be terminated early.

26. FORCE MAJEURE

If by reason of Force Majeure either Party shall be rendered unable, wholly or in part, to carry out its responsibilities under this contract by any occurrence by reason of Force Majeure, then the Party unable to carry out its responsibility shall give the other Party notice and full particulars of such Force Majeure in writing within a reasonable time after the occurrence of the event, and such notice shall suspend the Party's responsibility for the continuance of the Force Majeure claimed, but for no longer period.

Force Majeure means acts of God, floods, hurricanes, tropical storms, tornadoes, earthquakes, or other natural disasters, acts of a public enemy, acts of terrorism, sovereign conduct, riots, civil commotion, strikes or lockouts, and other causes that are not occasioned by either Party's conduct which by the exercise of due diligence the Party is unable to overcome and which substantially interferes with operations.

27. ESTIMATED QUANTITIES

Any reference to quantities shown in the request for proposal is an estimate only. Since the exact quantities cannot be predetermined, the County reserves the right to adjust quantities as deemed necessary to meet its requirements.

28. CONTRACTOR INVESTIGATION

Before submitting a proposal, each proposer shall make all investigations and examinations necessary to ascertain all site conditions and requirements affecting the full performance of the contract and to verify any representations made by the County upon which the contractor will rely. Proposer shall exercise due diligence and is further charged with knowledge of the local, State, and Federal laws, rules, and regulations applicable to this contract. If the proposer receives an award as a result of its proposal submission in this procurement, the proposer's failure to have made such investigations and examinations will in no way relieve the proposer from its obligation to comply in every detail with

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all provisions and requirements of the contract, nor will a plea of ignorance of such conditions and requirements be accepted as a basis for any claim whatsoever by the contractor for additional compensation and/or for excused nonperformance.

29. NO COMMITMENT BY COUNTY OF GALVESTON

This request for procurement does not commit the County of Galveston to award any costs or pay any costs, or to award any contract, or to pay any costs associated with or incurred in the preparation of a proposal in response to this request for proposal and does not commit the County of Galveston to procure or contract for services or supplies.

30. PROPOSAL COSTS BORNE BY PROPOSER

Galveston County shall not be liable for any costs incurred by proposer in preparation, production, or submission of a proposal, including but not limited to best and final offer if applicable. As well, Galveston County shall not be liable for any work performed by proposer prior to issuance of fully executed contract and properly issued notice to proceed. Galveston County shall not be liable for any costs incurred by proposer by reason of attending a pre-proposal conference. Galveston County shall not be liable for any costs incurred by proposer by reason of the County invoking use of best and final offers.

31. BEST AND FINAL OFFERS (BAFO)

In acceptance of proposals, the County reserves the right to negotiate further with one or more of the proposers as to any features of their proposals and to accept modifications of the work and price when such action will be in the best interest of the County. This includes, but is not limited to, the solicitation of a Best and Final Offer from one or more of the proposers. If a Best and Final Offer is invoked, this allows acceptable proposers the opportunity to amend, change, or supplement their original proposal. Proposers may be contacted in writing by the Purchasing Agent, requesting that they submit their Best and Final Offer. Any such Best and Final Offer must include discussed and negotiated changes.

32. SINGLE PROPOSAL RESPONSE

If only one proposal is received in response to the request for proposal, a detailed cost proposal may be requested of the single proposer. A cost/price analysis and evaluation and/or audit may be performed of the cost proposal in order to determine if the price is fair and reasonable.

33. CHANGES IN SPECIFICATIONS

If it becomes necessary to revise any part of this proposal, a written notice of such revision will be provided to all proposers in the form of addenda. The County is not bound by any oral representations, clarifications, or changes made in the written specifications by the County's employees or officials, unless such clarification or change is provided to proposers in a written addendum from the Purchasing Agent. Proposers are advised to inquire prior to the submission deadline as to whether any addenda to this request for proposal have been issued, as the successful proposer will be required to abide by such addenda.

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The County of Galveston reserves the right to revise or amend the specifications up to the time set for opening of proposals. Such revisions and amendments, if any, shall be announced by form of addenda. Copies of such addenda (or addendum in the event only one addendum is issued in the procurement) shall be furnished to all prospective contractors. Prospective contractors are defined as those contractors listed on the County's request for proposal list for this material/service or those who have obtained documents from the Purchasing Agent's Office subsequent to the advertisement. If revisions and amendments require changes in quantities or prices proposed, or both, the date set for opening of proposals may be postponed by such number of days as in the opinion of the County shall enable prospective contractors to revise their proposals. In any case, the proposal opening shall be at least seven (7) business days after the last revising or amendment addendum and the addendum shall include an announcement of the new date, if applicable, for the opening of proposals.

34. PROPOSAL IDEAS AND CONCEPTS

The County reserves to itself the right to adopt or use for its benefit, any concept, plan, or idea contained in any proposal.

35. PROPOSAL DISCLOSURES

While this procurement is pending, the names of those who submitted proposals will not be made public unless in conformity with the County Purchasing Act. Likewise, no pricing, staffing, or other contents of the proposal information will be released unless in conformity with the County Purchasing Act. Proposers are requested to withhold all inquiries regarding their proposal or other submissions until after an award is made. No communication is to be had with any County employee or official, other than the County Purchasing Agent, regarding whether a proposal was received - violations of this provision may result in the rejection of a proposal.

36. INDEMNIFICATION

The contractor shall agree to assume all risks and responsibility for, and agrees to indemnify, defend, and save harmless, the County of Galveston, its elected and appointed officials and department heads, and its agents and employees from and against all claims, demands, suits, actions, recoveries, judgments, and costs and expenses including reasonable attorney's fees for the defense thereof in connection therewith on account of the loss of life, property or injury or damage to the person which shall arise from contractor's operations under this contract, its use of County facilities and/or equipment or from any other breach on the part of the contractor, its employees, agents or any person(s), in or about the County's facilities with the expressed or implied consent of the County. Contractor shall pay any judgment with cost which may be obtained against Galveston County resulting from contractor's operations under this contract.

Contractor agrees to indemnify and hold the County harmless from all claims of subcontractors, laborers incurred in the performance of this contract. Contractor shall furnish satisfactory evidence that all obligations of this nature herein above designated have been paid, discharged or waived. If Contractor fails to do so, then the County reserves the right to pay unpaid bills of which County has written notice direct and withhold from Contractor's unpaid compensation a sum of money reasonably sufficient to liquidate any and all such lawful claims.

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37. REQUIREMENT OF AND PROOF OF INSURANCE

The successful proposer shall furnish evidence of insurance to the County Purchasing Agent and shall maintain such insurance as required hereunder or as may be required in the Special Provisions or resultant contract, if different. Contractor shall obtain and thereafter continuously maintain in full force and effect, commercial general liability insurance, including but not limited to bodily injury, property damage, and contractual liability, with combined single limits as listed below or as may be required by State or Federal law, whichever is greater.

A. For damages arising out of bodily injury to or death of one person in any one accident :
ONE HUNDRED THOUSAND AND NO/100 ($100,000.00) DOLLARS.

B. For damages arising out of bodily injury to or death of two or more persons in any one accident:
THREE HUNDRED THOUSAND AND NO/100 ($300,000.00) DOLLARS.

C. For any injury to or destruction of property in any one accident :
ONE HUNDRED THOUSAND AND NO/100 ($100,000.00) DOLLARS.

Insurance shall be placed with insurers having an A.M. Best's rating of no less than A. Such insurance must be issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions insuring the public from loss or damage that may arise to any person or property by reason of services rendered by Contractor.

Galveston County shall be listed as the additional insured on policy certificates and shall be provided with no less than thirty (30) calendar days prior notice of any changes to the policy during the contractual period.

Certificates of Insurance, fully executed by a licensed representative of the insurance company written or countersigned by an authorized Texas state agency, shall be filed with the County Purchasing Agent within ten (10) business days of issuance of notification from the County Purchasing Agent to proposer that the contract is being activated as written proof of such insurance and further provided that proposer shall not commence work under this contract until it has obtained all insurance required herein, provided written proof as required herein, and received written notice to proceed issued from the County Purchasing Agent.

Proof of renewal/replacement coverage shall be provided prior to the expiration, termination, or cancellation date of any policy and Galveston County shall be named as an additional insured on any such renewal/replacement coverage and a certificate of insurance showing such shall be provided to the Purchasing Agent. Said insurance shall not be cancelled, permitted to expire, or changed without at least thirty (30) days prior written notice to the County.

Insurance required herein shall be maintained in full force and effect during the life of this contract and shall be issued on an occurrence basis. Contractor shall require that any and all subcontractors that are not protected under the Contractor's own insurance policies take and maintain insurance of the same nature and in the same amounts as required of Contractor and provide written proof of such insurance to Contractor. Proof of renewed/replacement coverage shall be provided prior to the expiration, termination, or cancellation date of any policy. Contractor shall not allow any subcontractor to commence work on the subcontract until such insurance required for the subcontractor has been obtained and approved.

Workers' Compensation Insurance: Successful proposer shall carry in full force Workers' Compensation Insurance Policy(ies), if there is more than one employee, for all its' employees, including but not limited to full time, part time, and emergency employees employed by the successful proposer. Current insurance certificates certifying that such policies as specified above are in full force and effect shall be furnished by successful proposer to the County.

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Insurance is to be placed with insurers having a Best rating of no less than A. The proposer shall furnish the County with certificates of insurance and original endorsements affecting coverage required by these insurance clauses within ten (10) business days of receiving notification from the County Purchasing Agent that the contract is being activated. The certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf. The proposer shall be required to submit annual renewals for the term of this contract prior to expiration of any policy.

In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

The County agrees to provide proposer with reasonable and timely notice of any claim, demand, or cause of action made or brought against the County arising out of or related to utilization of the property. Proposer shall have the right to defend any such claim, demand, or cause of action at its sole cost and expense and within its sole and exclusive discretion. The County agrees not to compromise or settle any claim or cause of action arising out of or related to the utilization of the property without the prior written consent of the proposer.

In no event shall the County be liable for any damage to or destruction of any property belonging to the proposer.

Subrogation Waiver. Proposer and proposer's insurance carrier waive any and all rights to subrogation against Galveston County in regard to any suit or claim arising out of personal injury or property damage resulting from proposer's performance under this agreement.

38. PROPOSAL GUARANTEE

Unless specified differently within the Special Provisions of this procurement, each proposer shall be required to submit a proposal guarantee with its proposal as required within this Section.

Evidencing its firm commitment to engage in contract if proposer is selected for award of contract, each proposer is required to furnish with their bid a cashier's check or an acceptable proposer's bond (generally, a bid bond) in the amount of five percent (5%) of the total contract price. If proposer is using a bond, then the bond must be executed with a surety company authorized to do business in the State of Texas. Failure to furnish the proposal guarantee in the proper form and amount, by the time set for opening of proposals may be cause for rejection of the proposal.

The cashier's check or proposer bond (as applicable) will be returned to each respective unsuccessful proposer(s) subsequent to the Commissioners Court award of contract, and shall be returned to the successful proposer upon the completion and submission of all contract documents. Provided however, that the cashier's check or proposer bond will be forfeited to the County as liquidated damages should successful proposer fail to execute the contract within thirty (30) days after receiving notice of the acceptance of its proposal.

39. PERFORMANCE AND PAYMENT BONDS (if required)

Successful proposer, before beginning work, shall execute a performance bond and a payment bond, each of which must be in the amount of the contract. The required payment and performance bonds must each be executed by a corporate surety authorized to write surety bonds in the State of Texas and in accordance with Chapter 3503 of the Insurance Code (codified in 2005 and originally within Section 1, Chapter 87, Acts of the 56th Leg., R.S., 1959, and in Article 7.19-1, Vernon's Texas Insurance Code).

The performance and payment bonds must each clearly and prominently display on the bond or on an attachment to the bond:

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a.) The name, mailing address, physical address, and telephone number, including the area code, of the surety company to which any notice of claim should be sent; or

b.) The toll-free telephone number maintained by the Texas Department of Insurance under Subchapter B, Chapter 521, Insurance Code, and a statement that the address of the surety company to which any notice of claim should be sent may be obtained from the Texas Department of Insurance by calling the toll free-telephone number.

The performance bond shall be solely for the protection of Galveston County, in the full amount of the contract, and conditioned on the faithful performance of the work in accordance with the plans, specifications, and contract documents. The payment bond is solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the prime contractor or a subcontractor to supply labor or material, and in the amount of the contract.

The payment and performance bonds required to be furnished herein must be furnished before the contractor begins work and are a requirement for issuance of a Notice to Proceed. Such bonds must be furnished to the Galveston County Purchasing Agent within thirty (30) calendar days after the date of the full execution of the contract or, if applicable, as required under Chapter 2253, Government Code, whichever is earlier. Contractor's failure to provide the required payment and performance bonds within such time period shall constitute an event of default under this contract. Contractor shall not commence work until all applicable certificates of insurance, performance bonds, and payment bonds have been received and approved by the County Purchasing Agent and the Contractor receives notice to proceed in writing that has been issued by the County Purchasing Agent.

Additionally, if this request for proposal is for the award of a public works contract, then compliance with Chapter 2253 of the Texas Government Code, which is known as the McGregor Act, is mandatory. Performance and payment bonds are required to be furnished in accordance with Chapter 2253 of the Texas Government Code. Proposer should familiarize itself with the entire provisions of Chapter 2253 of the Texas Government Code.

40. PATENT AND COPYRIGHT PROTECTION

The proposer agrees at its sole expense to protect the County from claims involving infringement of patents, copyright, trademark, trade secret, or other intellectual property rights. **Proposer shall indemnify and save harmless the County of Galveston, its officers, employees, and agents, from liability of any nature and kind whatsoever, including without limitation cost and expenses, for or on account of any copyrighted, trademarked, trade secret, patented or un-patented invention, process, or article manufactured or used in the performance of the contract, or other intellectual property rights, including its use by the County.** Proposer also agrees that if proposer is awarded this contract, that no work performed hereunder shall be subject to patent, copyright, or other intellectual property by proposer.

41. CONFLICT OF INTEREST DISCLOSURE REPORTING (FORM CIQ)

Proposer may be required under Chapter 176 of the Texas Local Government Code to complete and file a conflict of interest questionnaire (CIQ Form). The CIQ Form pertains to business relationship, gift giving and family relationship reporting. If proposer is required to file a CIQ Form, then the completed CIQ Form must be filed with the County Clerk of Galveston County, Texas.

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Business relationship. If proposer has an employment or other business relationship with a local government officer of Galveston County or with a family member of a local government officer of Galveston County that results in the officer or family member of the officer receiving taxable income that exceeds $2,500.00 during the preceding 12-month period, then proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

Gift-giving. If proposer has given a local government officer of Galveston County or a family member of a local government officer of Galveston County one or more gifts with an aggregate value of more than one-hundred dollars ($100.00) during the preceding 12-months, then proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

Family member. For purposes of the business relationship and gift giving reporting requirements, a "family member" means a person related to another person with the first degree of consanguinity or affinity, as described by Subchapter B, Chapter 573, Texas Government Code. Examples of persons within the first degree by consanguinity or affinity include a son, daughter, father, mother, spouse, son-in-law, daughter-in-law, father-in-law, mother-in-law, stepson, stepdaughter, stepmother, and stepfather.

Family relationship. If proposer has a "family relationship" with a local government officer of Galveston County then proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County, regardless of whether proposer has a business relationship or has given gifts to the local government officer or a family member of the local government officer. For this purpose, "family relationship" means proposer is related within the third degree by consanguinity or the second degree by affinity, as those terms are defined under Chapter 573 of the Texas Government Code, to a local government officer of Galveston County. Examples of such relationships include a son, daughter, mother, father, brother, sister, grandchild, great-grandchild, grandparent, great-grandparent, niece, nephew, uncle, aunt, spouse, mother-in-law, father-in-law, daughter-in-law, son-in-law, spouse's grandchild, spouse's grandparent, grandparent's spouse, grandchild's spouse, stepson, stepdaughter, stepmother, and stepfather.

Proposer must file its original CIQ Form with the Galveston County Clerk. The Galveston County Clerk has offices at the following locations:

Galveston County Clerk
Galveston County Justice Center, Suite 2001
600 59th Street
Galveston, Texas 77551

Galveston County Clerk
North County Annex, 1st Floor
174 Calder Road
League City, Texas 77573

Again, if proposer is required to file a CIQ Form, the original completed form is filed with the Galveston County Clerk (**not the Purchasing Agent**).

For proposer's convenience, a blank CIQ Form is enclosed with this proposal package. Blank CIQ Form(s) may also be obtained by visiting the Purchasing Agent's website – this website is linked from the Galveston County homepage, at http://www.co.galveston.tx.us.

Chapter 176 specifies deadlines for the filing of CIQ Forms (both initial filings and updated filings).

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It is proposer's sole responsibility to file a true and complete CIQ Form with the Galveston County Clerk if proposer is required to file by the requirements of Chapter 176 of the Local Government Code. Proposer is advised that it is an offense to fail to comply with the disclosure reporting requirements dictated under Chapter 176 of the Texas Local Government Code, and the failure to file may be grounds to void the contract, if proposer is awarded a contract.

If proposer has any questions about compliance with Chapter 176, proposer may wish to consult its' legal counsel. Compliance is the individual responsibility of each person, business, and agent who is subject to Chapter 176 of the Texas Local Government Code.

42. DISCLOSURE OF INTERESTED PARTIES/FORM 1295

Under Section 2252.908 of the Government Code, any business entity that enters into a contract with Galveston County that requires the approval of the Commissioners Court must submit a "Disclosure of Interested Parties" to the County prior to the execution of the contract. This form, the "Disclosure of Interested Parties" form was promulgated by the Texas Ethics Commission, and is the "Form 1295". **This procurement is subject to these requirements.**

The Texas Ethics Commission was charged with promulgating rules to implement Section 2252.908 of the Government Code. The rules adopted by the Texas Ethics Commission are located at Sections 46.1, 46.3, and 46.5 of Title 1 of the Texas Administrative Code. Thus, the law covering these requirements is located at Section 2252.908 of the Government Code, and in Title 1, Sections 46.1, 46.3, and 46.5 of the Texas Administrative Code.

The Texas Ethics Commission's website is: www.ethics.state.tx.us. The area of the Texas Ethics Commission website pertaining to Form 1295 is:

www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm.

Form 1295 must be completed electronically through the Texas Ethics Commission website (handwritten forms are not allowable). Once the business entity has completed their electronic filing of Form 1295, then the business entity must print out the electronically completed form, and sign and notarize the Form 1295. Once Form 1295 is signed and notarized, the business entity must submit their completed, signed, and notarized Form 1295 to the Galveston County Purchasing Agent.

Successful Proposer is and shall be subject to these requirements, and no resultant contract may be executed by the Commissioners Court until the completed, signed, and notarized Form 1295 is on file with the County Purchasing Agent.

No portion of the Form 1295 process commits the County to any type of award of contract whatsoever.

After the Purchasing Agent's Office receives the completed, signed, and notarized Form 1295, the Purchasing Agent's Office will, within 30 days, go the Texas Ethics Commission website to submit electronic confirmation of the County's receipt of the completed, signed, and notarized Form 1295.

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43. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS & REQUIREMENT TO REGISTER IN SAM

Proposer certifies that neither it, nor any of its Principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. Contractor agrees that it shall refund Galveston County for any payments made to Contractor while ineligible. Contractor acknowledges that Contractor's uncured failure to perform under this Agreement, if such should occur, may result in Contractor being debarred from performing additional work for the County, the respecting State Agency administering the grant funding the contract, if applicable, the State, FEMA or HUD (as applicable), and other Federal and State entities. Further, proposer has executed the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters and returned the fully completed and executed original certification with the submission of its proposal. **The truthful and fully completed and executed original of the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters <u>must</u> be included with the submission of proposer's proposal and is a mandatory requirement of this request for proposal. Proposer's failure to include the fully completed and executed original of this Certification shall be considered non-compliance with the requirements of this request for proposal and grounds for the rejection of proposer's proposal.** Proposer shall immediately notify the County Purchasing Agent if it becomes debarred or suspended, placed on the Consolidated List of Debarred Contractors, or in any other way becomes ineligible for award of contract by any Federal agency. This Certification is a material fact relied upon by Galveston County; if it is later determined that the contractor did not comply with 2 C.F.R. Part 180 and 2 C.F.R. Part 3000, in additional to the remedies available to Galveston County and the State agency administering this grant, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment of contractor.

If the contract to be awarded pursuant to this procurement involves the use of Federal funds, then proposer must also be registered in the Federal Contractor Registry through the System for Award Management (SAM) to be eligible for award of contract pursuant to this procurement.

Information regarding the SAM is available at:

http://www.federalcontractorregistry.com/?gclid=CIG1hf2rr8wCFYkCaQoducANZw or at https://www.sam.gov/portal/SAM/#1.

No contract involving the use of Federal funds may be awarded to any proposer unless and until such registration is current and in good standing under SAM. Successful proposer must maintain SAM registration throughout the entire term of the agreement with the County. If this contract involves the use of Federal funds, then proposer must enclose proof of such SAM registration within its response, which is also a mandatory requirement of this procurement; failure to enclose such proof shall be considered non-compliance with the requirements of this procurement and grounds for the rejection of proposer's response to this procurement (i.e., bid, proposal, or qualifications statement, as applicable).

44. SOVEREIGN IMMUNITY

The County specifically reserves any claim it may have to sovereign, qualified, or official immunity as a defense to any action arising in conjunction with this contract.

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45. CONTROLLING LAW AND VENUE

Proposer acknowledges and agrees that the contract is and shall be governed and construed by the laws of the State of Texas and that venue shall lie exclusively in a court of competent jurisdiction in Galveston County, Texas.

46. MERGERS, ACQUISITIONS

The Proposer shall be required to notify the County of any potential for merger or acquisition of which there is knowledge at the time that a proposal is submitted.

If subsequent to the award of any contract resulting from this request for proposal the proposer shall merge or be acquired by another firm, the following documents must be submitted to the County:

A. Corporate resolutions prepared by the awarded Bidder and the new entity ratifying acceptance of the original contract, terms, conditions and prices;
B. New proposer's Federal Identification Number (FEIN); and
C. New proposer's proposed operating plans.

Moreover, proposer is required to provide the County with notice of any anticipated merger or acquisition as soon as proposer has actual knowledge of the anticipated merger or acquisition. The New Proposer's proposed plan of operation must be submitted prior to merger to allow time for submission of such plan to the Commissioners' Court for its approval.

47. DELAYS

The County reserves the right to delay the scheduled commencement date of the contract if it is to the advantage of the County. There shall be no additional costs attributed to these delays should any occur. Proposer agrees it will make no claims for damages, for damages for lost revenues, for damages caused by breach of contract with third parties, or any other claim by proposer attributed to these delays, should any occur. In addition, proposer agrees that any contract it enters into with any third party in anticipation of the commencement of the contract will contain a statement that the third party will similarly make no claim for damages based on delay of the scheduled commencement date of the contract.

48. ACCURACY OF DATA

Information and data provided through this request for proposal are believed to be reasonably accurate.

49. SUBCONTRACTING/ASSIGNMENT

Proposer shall not assign, sell, or otherwise transfer its contract in whole or in part without prior written permission of the County acting by and through its Commissioners' Court. Such consent, if granted, shall not relieve the proposer of any of its responsibilities under this contract.

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50. INDEPENDENT CONTRACTOR

Proposer expressly acknowledges that it is an independent contractor. Nothing in this agreement is intended nor shall be construed to create an agency relationship, an employer/employee relationship, a joint venture relationship, or any other relationship allowing County to exercise control or direction over the manner or method by which proposer or proposer's subcontractors perform in providing the requirements stated in the request for proposal.

51. MONITORING PERFORMANCE

The County shall have the unfettered right to monitor and audit the proposer's work in every respect. In this regard, the proposer shall provide its full cooperation and insure the cooperation of its employees, agents, assigns, and subcontractors. Further, the proposer shall make available for inspection and/or copying when requested, original data, records, and accounts relating to the proposer's work and performance under this contract. In the event any such material is not held by the proposer in its original form, a true copy shall be provided.

52. SUBJECT TO APPROPRIATION OF FUNDS

State law prohibits the obligation and expenditure of public funds beyond the fiscal year for which a budget has been approved by the Commissioners Court. Galveston County anticipates this to be an integral part of future budgets to be approved during the periods of this contract, except for unanticipated needs or events which may prevent such payments against this contract. However, Galveston County cannot guarantee the availability of funds, and enters into this contract only to the extent such funds are made available through appropriation (allocation) by the Commissioners Court. This contract shall not be construed as creating any debt on behalf of the County of Galveston in violation of TEX. CONST. art. XI, § 7, and it is understood that all obligations of Galveston County are subject to the availability of funds.

53. CONTRACTS SUBJECT TO GRANT FUNDING

Notwithstanding the foregoing, if the contract to be awarded by this procurement is funded with Federal or State grant funds, the proposer acknowledges that the obligations of the County under the contract are contingent upon the continued availability of grant funding to meet the County's obligations. If the grant(s) to the County is reduced, de-obligated, or otherwise discontinued or terminated, Contractor agrees that the County may immediately terminate the contract without penalty or any liability whatsoever on the part of the County, the State, or the Federal awarding agency.

54. PROCUREMENT ETHICS

Galveston County is committed to the highest ethical standards. Therefore, it is a serious breach of the public trust to subvert the public purchasing process by directing purchases to certain favored vendors, or to tamper with the competitive bidding process, whether it's done for kickbacks, friendship or any other reason. Since misuse of the purchasing power of a local government carries criminal penalties, and many such misuses are from a lack of clear guidelines about what constitutes an abuse of office, the Code of Ethics outlined below must be strictly followed.

Galveston County also requires ethical conduct from those who do business with the County.

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CODE OF ETHICS – Statement of Purchasing Policy:
Public employment is a public trust. It is the policy of Galveston County to promote and balance the objective of protecting the County's integrity and the objective of facilitating the recruitment and retention of personnel needed by Galveston County. Such policy is implemented by prescribing essential standards of ethical conduct without creating unnecessary obstacles to entering public office.

Public employees must discharge their duties impartially so as to assure fair competitive access to governmental procurement by responsible contractors. Moreover, they should conduct themselves in such a manner as to foster public confidence in the integrity of the Galveston County procurement organization.

To achieve the purpose of this Article, it is essential that those doing business with Galveston County also observe the ethical standards prescribed herein.

General Ethical Standards:
It shall be a breach of ethics to attempt to realize personal gain through public employment with Galveston County by any conduct inconsistent with the proper discharge of the employee's duties.

It shall be a breach of ethics to attempt to influence any public employee of Galveston County to breach the standards of ethical conduct set forth in this code.

It shall be a breach of ethics for any employee of Galveston County to participate directly or indirectly in a procurement when the employee knows that:

- The employee or any member of the employee's immediate family, has a financial interest pertaining to the procurement;
- A business or organization in which the employee or any member of the employee's immediate family, has a financial interest pertaining to the procurement; or
- Any other person, business, or organization with which the employee or any member of the employee's immediate family is negotiating or has an arrangement concerning prospective employment is involved in the procurement.

Gratuities:
It shall be a breach of ethics for any person to offer, give, or agree to give any employee or former employee of Galveston County, or for any employee or former employee of Galveston County to solicit, demand, accept or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation of any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or bid pending before this government.

Kickbacks:
It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for Galveston County, or to any person associated therewith, as an inducement for the award of a contract, subcontract or order.

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Contract Clause:
The prohibition against gratuities and kickbacks prescribed above shall be conspicuously set forth in every contract and solicitation by Galveston County.

Confidential Information:
It shall be a breach of ethics for any employee or former employee of Galveston County to knowingly use confidential information for actual or anticipated personal gain, or for the actual or anticipated gain of any other person.

Prohibition against Contingent Fees:
It shall be a breach of ethical standards for a person to be retained, or to retain a person, to solicit or secure a Galveston County contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies for the purpose of securing business. Failure to abide by this section constitutes a breach of ethical standards.

Representation:
Proposer represents and warrants, by signing and submitting its proposal, that it has not retained anyone in violation of this section prohibiting contingent fees.

Contract Clause:
The representation prescribed above shall be conspicuously set forth in every contract and solicitation thereof.

55. NON-COLLUSION AFFIDAVIT
Proposer certifies, by signing and submitting a proposal , that the proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the proposal is genuine and not collusive or sham; that the contractor has not directly or indirectly induced or solicited another contractor to put in a false or sham proposal, and has not directly or indirectly colluded, conspired, connived, or agreed with any contractor or anyone else to put in a sham proposal or that anyone shall refrain from bidding; that the contractor has not in any manner, directly or indirectly, sought by agreement, communications, or conference with anyone to fix the bid price of the contractor of any other proposer, or to fix any overhead, profit or cost element of the proposal price, or that of any other contractor, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in the proposal are true; and further, that the contractor has not, directly or indirectly, submitted his or her proposal price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any cooperation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham proposal.

A blank Non-Collusion Affidavit is included with this proposal packet. Proposer must enclose a truthful and fully executed original Non-Collusion Affidavit with the submission of its proposal. This is a mandatory requirement of this request for proposal. Failure to include the truthfully and fully executed Non-Collusion Affidavit in the submission of its proposal shall be considered non-compliance with the requirements of this request for proposal by the Proposer and grounds for the rejection of Proposer's submission.

No negotiations, decisions, or actions shall be initiated by any company as a result of any verbal discussion with any County employee prior to the opening of responses to this request for proposal.

No officer or employee of the County of Galveston, and no other public or elected official, or employee, who may exercise any function or responsibilities in the review or approval of this undertaking shall have any personal or financial interest, direct or indirect, in any contract or negotiation process thereof. The above compliance request will be part of all County of Galveston contracts for this service.

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56. CERTIFICATION REGARDING LOBBYING

Proposer certifies that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder, to any person for influencing or attempting to influence a department or employee of an agency, a member of Congress, or an employee of a member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

b. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence a department or employee of any agency, a member of Congress, a department or employee of congress, or an employee of a member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the bidder shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.

c. Proposer shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

The truthful and fully completed and executed original of the Certification Regarding Lobbying (included with bid packet) must be included with the submission of proposer's proposal and is a mandatory requirement of this request for proposal. Proposer's failure to include the fully completed and executed or original of this Certification shall be considered non-compliant with the requirements of this request for proposal and grounds for the rejection of the Proposer's proposal. Submission of the certification is a prerequisite for making or entering into a contract with Proposer and is imposed by Section 1352, Title 31, United States Code. Further, any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

57. NON-DISCRIMINATION

a. **Equal Employment Opportunity:** Proposer will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, genetic information or veteran status. Proposer will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, national origin, sex, disability, genetic information or veteran status. Such action shall include, but not be limited to, the following: employment; upgrading; demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Proposer agrees to post in conspicuous places, available to employees and applicants for employment, notices of employment.

Proposer will, in all solicitation or advertisements for employees placed by or on behalf of proposer, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, sex, disability, genetic information, or veteran status.

Proposer will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Agreement so that such provisions will be binding upon each subcontractor, provided that the foregoing provisions shall not apply to contracts or subcontracts for standard commercial supplies or raw materials.

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Proposer will include the provisions herein in every subcontract or purchase order unless exempted.

b. Drug Free Work Place Act: Proposer shall comply with all applicable requirements of the Drug-Free Workplace Act of 1988 (Public Law 100-690, Title V, Subtitle D; 41 U.S.C. § 8102, et seq.) and implementing regulations thereunder.

c. Americans with Disabilities Act: Proposer shall comply with all applicable provisions of the Americans with Disabilities Act of 1990 (Public Law 101-136) and implementing regulations thereunder.

d. OSHA Regulations: Proposer agrees to maintain and to display any applicable materials for its employees in accordance with OSHA regulations.

e. Compliance with Immigration Laws and Use of E-Verify: Proposer agrees to comply with all requirements of the U.S. Immigration Reform and Control Act of 1986, as amended, and any implementing regulations thereto. Proposer further agrees to utilize the E-Verify system through the Department of Homeland Security on its employees. Proposer shall not employ unauthorized aliens, and shall not assign services to be performed to any supplier or subcontractor who are unauthorized aliens. If any personnel performing any services hereunder are discovered to be an unauthorized alien, then Proposer will immediately remove such personnel from performing services hereunder and shall replace such personnel with personnel who are not unauthorized alien(s).

f. State and Federal Law Compliance: Proposer agrees to comply with all other State and Federal laws and regulations applicable to the provision of services under this contract.

58. RECORD RETENTION AND RIGHT TO AUDIT

Proposer shall keep and maintain all records associated with this contract for a minimum of five (5) years from the close of the contract or as required by Federal or State law or regulation, whichever period is longer. If awarded this contract, proposer shall allow the County reasonable access to the records in proposer's possession, custody, or control that the County deems necessary to assist it in auditing the services, costs, and payments provided hereunder. If this contract involves the use of Federal or State funds, then proposer shall also allow reasonable access to representatives of the Office of Inspector General, the General Accounting Office, and the other Federal and/or State agencies overseeing the funds that such entities deem necessary to facilitate review by such agencies and proposer shall maintain fiscal records and supporting documentation for all expenditures in a manner that conforms with OMB Circular A-87 (relocated to 2 C.F.R. Part 225) and this contract.

59. TITLE VI ASSURANCES/TxDOT

The County is subject to Title VI of the Civil Rights Act of 1964 and the Federal and State laws and regulations of the United States Department of Transportation and Texas Department of Transportation (TxDOT). Pursuant to these requirements, the County must have its contractors provide required assurances on compliance with non-discrimination by itself and its subcontractors. The Title VI Assurances within this Subsection are not exhaustive – whenever any Federal, State, or Local requirement requires additional clauses, this list shall not be construed as limiting. Contractor agrees as follows:

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(1) **Compliance with Regulations**: The Contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, DOT) Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are incorporated herein by reference and made a part of this contract.

(2) **Non-discrimination**: The Contractor, with regard to the work performed by it during the contract, shall not discriminate on the basis of race, color, national origin, religion, sex, age, disability or Veteran status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

(3) **Solicitations for Subcontractors, Including Procurement of Materials and Equipment**: In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurement of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, national origin, religion, sex, age, disability or Veteran status.

(4) **Information and Reports**: The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the Galveston County or the Texas Department of Transportation to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of the Contractor is in the exclusive possession of another who fails or refuses to furnish this information the Contractor shall so certify to Galveston County or the Texas Department of Transportation as appropriate, and shall set forth what efforts it has made to obtain the information.

(5) **Sanctions for Non-compliance**: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, Galveston County shall impose such contract sanctions as it or the Texas Department of Transportation may determine to be appropriate, including, but not limited to:

(a) withholding of payments to the Contractor under the contract until the Contractor complies, and/or;
(b) cancellation, termination, or suspension of the contract, in whole or in part.

(6) **Incorporation of Provisions**. The Contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as Galveston County or the Texas Department of Transportation may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request Galveston County to enter into such litigation to protect the interests of Galveston County, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

60. SECTION 231.006, FAMILY CODE/DELINQUENT CHILD SUPPORT

Pursuant to Title 5, Section 231.006 of the Texas Family Code, as applicable, Proposer certifies that it, including all of its principals, is/are current in child support payments and that it is eligible to receive payments from State funds under a contract for property, materials, or services. Proposer acknowledges and agrees that if it is awarded this

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contract, then the ensuing agreement may be terminated and payment withheld if this certification is inaccurate. Finally, by the submission of its proposal, the Proposer certifies that it has included the names and social security numbers of each person with at least 25% ownership interest in Proposer within its response to the request for proposal and that all such persons are current in child support payments.

61. ANTITRUST

Pursuant to 15 U.S.C. § 1, et seq., and Texas Business and Commerce Code, Chapter 15, Contractor, by the submission of its proposal, certifies that neither Contractor nor any natural person, proprietorship, firm, corporation, partnership, association, or institution represented by Contractor or anyone acting for such natural person, proprietorship, firm, corporation, partnership, association, or institution has violated any Federal or State antitrust laws or communicated the nature of the offer, directly or indirectly, to any competitor or other person engaged in a similar line of business.

62. LABOR STANDARDS

On contracts funded under a federal grant: Proposer acknowledges that the contract to be awarded pursuant to this solicitation is on a grant program funded with Federal funds. Proposer shall comply with the requirements of 29 CFR Part 5 and Part 30 and shall be in conformity with Executive Order 11246, entitled "Equal Employment Opportunity", Copeland, "Anti-Kickback" Act (40 U.S.C. 3145, 29 C.F.R. Part 3), the Davis-Bacon and Related Acts (40 U.S.C. 3141-3148, 29 C.F.R. Parts 1,3, and 5), the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.), and all other applicable Federal, State, and local laws and regulations pertaining to labor standards, insofar as those acts apply to the performance of this Agreement. Proposer is also responsible for ensuring that all subcontractors comply with the requirements of 29 CFR Part 5 and Part 30 and shall be in conformity with Executive Order 11246, entitled "Equal Employment Opportunity", Copeland "Anti-Kickback" Act, the Davis-Bacon and Related Acts (29 CFR Parts 1, 3 and 5), the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.), and all other applicable Federal, State, and local laws and regulations pertaining to labor standards, insofar as those acts apply to the performance of this Agreement.

63. PROCUREMENT LAWS

a. Proposer shall comply with all applicable local, State, and Federal laws, rules, and regulations.

b. If this contract is made pursuant to a federal award, then Contractor acknowledges that the contract is subject, without limitation, to applicable provisions within 2 C.F.R. Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards. Contractor shall comply with applicable provisions within 2 C.F.R., Sections 200.319 through 200.326, including but not limited to the following:

1.) **Equal Employment Opportunity**, 41 C.F.R. Part 60-1.4(b) (applicable to federally assisted construction contracts).

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

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national original, disability, or veteran status. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, national original, disability or veteran status. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training,

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including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national original, disability, or veteran status.

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

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

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

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

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

2.) **Small and minority business, women's business enterprises, and labor surplus area firms (2 C.F.R. § 200.321).** The County is required to take affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. This includes requiring the prime contractor, if subcontracts are to be let in the performance of this contract, to itself take affirmative steps in letting the subcontract. Accordingly, if subcontracts are to be let in the performance of this contract, the contractor must take affirmative steps in the letting of the subcontract(s), which must include:

(a) placing qualified small and minority businesses and women's business enterprises on solicitation lists;
(b) assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

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(c) dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; and

(d) using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

In accordance with FEMA procurement guidance:

A small business is a business that is independently owned and operated, not dominant in the field of operation in which it is bidding on Galveston County contracts, and qualified as a small business under the Small Business Administration criteria and size standards at 13 C.F.R. Part 121.

A women's business enterprise is a business enterprise that is: (a) at least 51 percent owned by one or more women or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women; and (b) whose management and daily operations are controlled by one or more women.

A minority business is a business that is (a) at least 51 percent owned by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority group members; and (b) whose management and daily operations are controlled by one or more minority group members.

3.) **Davis-Bacon Act as amended (40 U.S.C. 3141-3148).** When required by Federal program legislation, all prime construction contracts in excess of $2,000 must include a provision for compliance with the Davis-Bacon Act as supplemented by the Department of Labor regulations (29 C.F.R. Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractor must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity (the County) must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be condition upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contract must also include a provision for compliance with the Copeland Anti-Kickback Act (40 U.S.C. § 3145) as supplemented by the Department of Labor regulations (29 C.F.R. Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States").

4.) **Compliance with the Copeland "Anti-Kickback" Act.** Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which the person is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. "Whoever, by force, intimidation, or threat of procuring dismissal from employment, or by any other manner whatsoever induces any person employed in the construction, prosecution, completion or repair of any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, to give up any part of the compensation to which he is entitled under his contract of employment, shall be fined under this title [Title 18, U.S.C.] or imprisoned not more than five years, or both." 18 U.S.C. § 874.

(a) Contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. Part 3 as may be applicable, which are incorporated by reference into this contract.

(b) The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as the Federal awarding agency may be appropriate instructions require, and also a clause requiring the subcontractors

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to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.

(c) Breach. A breach of the contract clause above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

5.) **Contract Work Hours and Safety Standards Act.**

(a) Where applicable, all contracts awarded by the County in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704, as supplemented by the Department of Labor regulations at 29 C.F.R. Part 5. Under 40 U.S.C. § 3702 of the Contract Work Hours and Safety Standards Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.S. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchase of supplies or material or articles ordinarily available on the open market, or contractors for transportation or transmission of intelligence.

(b) Compliance with the Contract Work Hours and Safety Standards Act.

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this subsection the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this subsection, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard work week of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this subsection.

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

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this subsection and also a clause requiring the subcontractors to include these

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clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this subsection.

6.) **Rights to Inventions Made Under a Contractor Agreement.**

(a) If the Federal award meets the definition of "funding agreement" under 37 C.F.R. § 401.2(a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under the "funding agreement," the recipient or subrecipient must comply with the requirements of 37 C.F.R. Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

(b) Stafford Act Disaster Grants. This requirement does not apply to Public Assistance, Hazard Mitigation Grant Program, Crisis Counseling Assistance and Training Grant program, Disaster Case Management Grant Program, and Federal Assistance to Individuals and Households – Other Needs Assistance Grant Program, as FEMA awards under these programs do not meet the definition of "funding agreement."

(c) The regulations and 37 C.F.R. § 401.2(a) currently defines "funding agreement" as any contract, grant, or cooperative agreement entered into between any Federal agency, other than the Tennessee Valley Authority, and any contractor for the performance of experimental, developmental, or research work funded in whole or in part by the Federal government. This term also includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under a funding agreement as defined in the first sentence of this paragraph.

7.) **Clean Air Act (42 U.S.C. §§ 7401 – 7671q) and the Federal Water Pollution Control Act 933 U.S.C. §§ 1251-1387), as amended.**

(a) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401, et seq., and agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Contract Act, as amended, 33 U.S. C. § 1251, et seq.

(b) The contractor agrees to report each violation of the Clean Air Act and/or the Federal Water Pollution Control Act to the Federal awarding agency, the State agency administering the grant, and the Regional Office of the Environmental Protection Agency (EPA) and understands and agrees that the Federal awarding agency, the State agency, and the EPA will, in turn, report each violation as required to assure notification to Galveston County, the Federal Emergency Management Agency, and the appropriate EPA Regional Office.

8.) **Debarment and Suspension (Executive Orders 12549 and12689).** A contract award must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. Part 180 that implement Executive Orders 12549 and 12689. The Contractor is required to verify that none of the contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. §180.940) or disqualified (defined at 2 C.F.R. § 180.935).

Contractor must comply with 2 C.F.R. Part 180, Subpart C and 2 C.F.R. Part 3000, Subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. Proposer agrees to comply with the requirements of 2 C.F.R. Part 180, Subpart C, and 2 C.F.R. Part 3000, Subpart C, while this offer is valid and through the period of any contract that may arise from this offer. The proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

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9.) **Procurement of Recovered Materials.**

(a.) A non-Federal entity that is a State agency or agency of a political subdivision of the State and its contractors must comply with Section 6002 of the Solid Waste Disposal Act, Public Law No. 89-272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962).

(b.) In the performance of this contract, the contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—

(1) Competitively within a timeframe providing for compliance with the contract performance schedule;

(2) Meeting contract performance requirements; or

(3) At a reasonable price.

(c) Information about this requirement is available at EPA's Comprehensive Procurement Guidelines website, http://www.epa.gov/cpg/. The list of EPA-designated items is available at https://www.epa.gov/cpg/products.htm.

In the event of any discrepancy between the provisions in this Section 63 of General Provisions and provisions on the same subject elsewhere within this procurement, the most stringent shall control.

64. ENTIRETY OF AGREEMENT AND MODIFICATION

This contract contains the entire agreement between the parties. Any prior agreement, promise, negotiation or representation not expressly set forth in this contract has no force or effect. Any subsequent modification to this contract must be in writing, signed by both parties.

An official representative, employee, or agent of the County does not have the authority to modify or amend this contract except pursuant to specific authority to do so granted by the Galveston County Commissioners Court.

65. NOTICE

All notices or other communications required or permitted under this contract shall be in writing and shall be deemed to have been duly given if delivered personally in hand, transmitted by facsimile, or mailed certified mail, return receipt requested with proper postage affixed and addressed to the appropriate party at the following address or at such other address as may have been previously given in writing to the parties (proposer shall provide its notice information with its proposal submission). If mailed, the notice shall be deemed delivered when actually received, or if earlier, on the third day following deposit in a United States Postal Service post office or receptacle, duly certified, return receipt requested, with proper postage affixed. If delivered in person, notice shall be deemed delivered when receipted for by, or actually received by, the receiving Party. If transmitted by facsimile, notice shall be deemed delivered when receipt of such transmission is acknowledged.

To the County at:

Hon. Mark Henry,
County Judge of Galveston County
722 Moody (21st Street), Second (2nd) Floor
Galveston, Texas 77550
Fax: (409) 765-2653

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With copies to:

Rufus Crowder, CPPO CPPB,
Galveston County Purchasing Agent
722 Moody (21st Street), Fifth (5th) Floor
Galveston, Texas 77550
Fax: (409) 621-7997

Robert Boemer, Director,
Galveston County Legal Department
722 Moody (21st Street), Fifth (5th) Floor
Galveston, Texas 77550
Fax: (409) 770-5560

To the Contractor at:

(Proposer to provide its contact name, address, and facsimile number for notice under the contract.)

66. USE OF DHS SEAL, LOGO, AND FLAGS PROHIBITED WITHOUT PRIOR APPROVAL
Contractor must obtain permission from the U.S. Department of Homeland Security financial assistance office (DHS FAO) **prior** to using DHS seals(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials, including use of the United States Coast Guard seal, logo, crests or reproductions of flags or likenesses of Coast Guard Officials.

67. FEDERAL GOVERNMENT NOT A PARTY
Contractor acknowledges that the Federal Government is not a party to the contract and is not subject to any obligations or liabilities to Galveston County, contractor, or any other party pertaining to any matter resulting from the contract.

68. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS
In contracts funded through Federal grants, Contractor acknowledges that 31 U.S.C. Chapter 38, Administrative Remedies for False Claims and Statements (31 U.S.C. § 3801, et seq.) and the implementing regulations thereunder, 49 C.F.R. Part 79, apply to Contractors actions pertaining to the contract.

69. LEAD AND ASBESTOS
If this request for proposal involves remediation, demolition, reconstruction, rehabilitation, repair, or construction, or other applicable activities, the Contractor shall be responsible for performing investigations of lead and asbestos containing materials, and any required lead and asbestos abatement in compliance with Federal, State, and local laws, rules, regulations, ordinances and orders, relating to lead abatement and asbestos abatement as applicable, including but not limited to the Texas Asbestos Health Protection Act, codified as Chapter 1954 of the Occupations Code; the Texas Asbestos Health Protection Regulations, located at Title 25, Part 1, Chapter 295, Subchapter C of the Texas Administrative Code; Chapter 1955 of the Texas Occupations Code (lead-based paint abatement); the Texas Environmental Lead Reduction regulations, located at Title 25, Part 1, Chapter 295, Subchapter I of the Texas Administrative Code; the federal National Emission Standards for Asbestos regulations, located at Title 40, Part 61, Subpart M of the Code of Federal Regulations, and the National Emission Standards for Hazardous Air Pollutants. Contractor shall perform such inspections, encapsulation, remediation or other actions as required by federal, State, or local requirements in accordance with the federal Environmental Protection Agency (EPA), Texas Department of State Health Services (TXDSHS), and Texas Commission on Environmental Quality (TCEQ) requirements.

End of General Provision Section

RFP #B171023
OPEN: 09/14/2017
TIME: 2:00 P.M.

PROPOSAL FORM
CDBG ROUND 2.2 COWART CREEK TRIBUTARY TWO DRAINAGE PROJECT
COUNTY OF GALVESTON, TEXAS

By signing here, the firm does hereby attest that it has fully read the instructions, conditions and general and special provisions and understands them.

EXCEPTIONS (if no exceptions are taken, state NONE):

_____

_____

THE COMPANY OF: _____

ADDRESS: _____

_____

FEIN (TAX ID): _____

The following shall be returned with your proposal. Failure to do so may be ample cause for rejection of proposal as non- responsive. It is the responsibility of the Proposer to ensure that proposer has received all addenda.

Items:	**Confirmed (X):**
1. References (if required)	_____
2. Addenda, if any	#1_____ #2____ #3____ #4 ___
3. One (1) original and four (4) copies of submittal	_____
4. Proposal Form	_____
5. Vendor Qualification Packet	_____
6. Debarment Certification Form	_____
7. Non-Collusion Affidavit	_____
8. Form CIQ	_____
9. Proposal Cost Form	_____
10. Lobbyist Certificate	_____

Person to contact regarding this proposal: _____

Title: _____ Phone: _____ Fax: _____

E-mail address: _____

Name of person authorized to bid the Firm: _____

Signature: _____ Date: _____

Title: _____ Phone: _____ Fax: _____

E-mail address: _____

RFP #B171023
OPEN: 09/14/2017
TIME: 2:00 P.M.

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Proposer shall use this form to provide the information for notice.

1. Contact information for notice:

   Name:_____
   Address:_____
   _____
   Telephone Number:_____ Facsimile number:_____

2. If a copy of notice is requested, please complete below:

   Name:_____
   Address:_____
   _____
   Telephone Number:_____ Facsimile number:_____

3. If second or more copies are requested for notice, please supplement this form and clearly mark the supplement as "Supplementary Notice Information."

   Proposer to submit reference information. Proposer shall use this form to provide minimum required reference information. If Proposer wishes to provide more than the minimum, Proposer should supplement this form and should clearly mark the supplement as "Supplementary Reference Information."

1. References who can attest to the Proposer's capability to carry out the requirements set forth in this proposal:

   Business Name of Organization:_____
   Name of Person:_____
   Title of Individual within Organization, if applicable_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

   Business Name of Organization:_____
   Name of Person:_____
   Title of Individual within Organization, if applicable_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

   Business Name of Organization:_____
   Name of Person:_____
   Title of Individual within Organization, if applicable_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

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References of major supplier of Proposer who can speak to the financial capability of the Proposer to carry out the requirements set forth in this proposal:

1. Business Name of Supplier_____
   Name of Person:_____
   Title of Individual within business:_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

2. Business Name of Supplier_____
   Name of Person:_____
   Title of Individual within business:_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

3. Business Name of Supplier_____
   Name of Person:_____
   Title of Individual within business:_____
   Business address:_____
   _____
   Telephone number:_____ Facsimile number:_____

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CERTIFICATION REGARDING LOBBYING
(31 U.S.C.A. § 1352)
This Certification must be completed, signed, dated and returned to the Galveston County Purchasing Agent

Procurement Number and Description:_____

RFP #B171023 CDBG Round 2.2 Cowart Creek Tributary Two Drainage Project

Proposer **CERTIFIES**, to the best of its knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the proposer, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the proposer shall complete and submit **Standard Form LLL**, "Disclosure Form to Report Lobbying", in accordance with its instructions.

3. Proposer shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

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

Name of Organization/Corporation:_____

Address:_____

City: _____ State:_____ Zip Code:_____

Signature of Authorized Signatory for Proposer:_____ Date Signed:_____

Title of Authorized Signatory of Proposer:_____

County of Galveston
Purchasing Department
Vendor Qualification Packet

(rev. 1.3, July 5, 2017)

All interested parties seeking consideration for qualified vendor status with the County of Galveston **should complete and return only the following attached forms to:**

Galveston County Purchasing Department
722 Moody Avenue, (21st Street), 5th Floor
Galveston, Texas 77550
(409) 770-5371 ***office***
(409) 621-7987 ***fax***

Form PEID: **Person /Entity Information Data**

Form W-9: **Request for Taxpayer Identification Number and Certification**
(please note that the included form may not be the latest revised form issued by the Internal Revenue Service. *Please check the IRS website at http://www.irs.gov/pub/irs-pdf/fw9.pdf for the latest revision of this form.)*

Form CIQ: **Conflict of Interest Questionnaire**
(please note that the included form may not be the latest revised form issued by the State of Texas Ethics Commission. *Please check the Texas Ethics Commission website at for the latest revision of this form. Please note that Galveston County Purchasing Agent is not responsible for the filing of this form with the Galveston County Clerk per instructions of the State of Texas Ethics Commission).*

Debarment: **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS & REQUIREMENT TO REGISTER IN SAM**
Vendors/contractor certifies that neither it, nor any of its Principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. Vendor agrees that it shall refund Galveston County for any payments made to Contractor while ineligible. Vendor acknowledges that Contractor's uncured failure to perform under any agreement with the County of Galveston, if such should occur, may result in Contractor being debarred from performing additional work for the County, the respecting State Agency administering the grant funding the contract, if applicable, the State, FEMA or HUD (as applicable), and other Federal and State entities. Further, Vendor has executed the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters and returned the fully completed and executed original certification with the submission of this Vendor Qualification Packet. ***The truthful and fully completed and executed original of the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters must be included with the submission of this Vendor Qualification Packet and is a mandatory requirement to become a vendor of Galveston County. Vendor's failure to include the fully completed and executed original of this Certification shall be considered non-compliant with the requirements of this vendor qualification request and grounds for the rejection of vendor's request.*** Vendor shall immediately notify the County Purchasing Agent if it becomes debarred or suspended, placed on the Consolidated List of Debarred Contractors, or in any other way becomes ineligible for award of contract by any Federal agency. This Certification is a material fact relied upon by Galveston County; if it is later determined that the vendor did not comply with 2 C.F.R. Part 180 and 2 C.F.R. Part 3000, in additional to the remedies available to

Galveston County and the State agency administering a grant, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment of contractor.

If the contract to be awarded pursuant to a Galveston County procurement effort involves the use of Federal funds, then vendor must also be registered in the Federal Contractor Registry through the System for Award Management (SAM) to be eligible for award of contract pursuant to the procurement.

Information regarding the SAM is available at:

http://www.federalcontractorregistry.com/?gclid=CIG1hf2rr8wCFYkCaQoducANZw or at https://www.sam.gov/portal/SAM/#1.

No contract involving the use of Federal funds may be awarded to any vendor unless and until such registration is current and in good standing under SAM. Successful vendors must maintain SAM registration throughout the entire term of any contractual agreement with the County. If a contract involves the use of Federal funds, then vendor must enclose proof of such SAM registration within its response, which is also a mandatory requirement of County procurement policy; failure to enclose such proof shall be considered non-compliant with the requirements of any procurement effort and grounds for the rejection of vendor's response to any procurement efforts (i.e., bid, proposal, or qualifications statement, as applicable).

Certificate(s) of Insurance: **If the person or entity seeking qualified vendor status with the County will be performing work at or on any County owned facility and/or property, Certificate(s) of Insurance are required to be submitted prior to performing any work.**

Insurance requirements are as follows:

Public Liability and Property Damage Insurance:

Successful vendor agrees to keep in full force and effect, a policy of public liability and property damage insurance issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions insuring the public from any loss or damage that may arise to any person or property by reason of services rendered by vendor. Vendor shall at its own expense be required to carry the following minimum insurance coverages:

- For damages arising out of bodily injury to or death of one person in any one occurrence – one hundred thousand and no/100 dollars ($100,000.00);
- For damages arising out of bodily injury to or death of two or more persons in any one occurrence – three hundred thousand and no/100 dollars ($300,000.00); and
- For injury to or destruction of property in any one occurrence – one hundred thousand and no/100 dollars ($100,000.00).

This insurance shall be either on an occurrence basis or on a claims made basis. Provided however, that if the coverage is on a claims made basis, then the vendor shall be required to purchase, at the termination of this agreement, tail coverage for the County for the period of the County's relationship with the vendor under this agreement. Such coverage shall be in the amounts set forth in subparagraphs (1), (2), and (3) above.

Worker's Compensation Insurance:

Successful vendor shall also carry in full force Workers' Compensation Insurance policy(ies), if there is more than one employee, for all employees, including but not limited to full time, part time, and emergency employees employed by the vendor. Current insurance certificates certifying that such policies as specified above are in full force and effect shall be furnished by the vendor to the County.

The County of Galveston shall be named as additional insured on policies listed in subparagraphs above and shall be notified of any changes to the policy(ies) during the contractual period.

Insurance is to be placed with insurers having a Best rating of no less than A. The vendor shall furnish the County with certificates of insurance and original endorsements affecting coverage required by these insurance clauses. The certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf. The vendor shall be required to submit annual renewals for the term of any contractual agreement, purchase order or term contract, with Galveston County prior to expiration of any policy.

In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

The County agrees to provide vendor with reasonable and timely notice of any claim, demand, or cause of action made or brought against the County arising out of or related to utilization of the property. Vendor shall have the right to defend any such claim, demand, or cause of action at its sole cost and expense and within its sole and exclusive discretion. The County agrees not to compromise or settle any claim or cause of action arising out of or related to the utilization of the property without the prior written consent of the vendor.

In no event shall the County be liable for any damage to or destruction of any property belonging to the vendor unless specified in writing and agreed upon by both parties.

Procurement Policy - Special Note:

Understand that it is, according to Texas Local Government Code, Section 262.011, Purchasing Agents, subsections (d), (e), and (f), the sole responsibility of the Purchasing Agent to supervise all procurement transactions.

Therefore, be advised that all procurement transactions require proper authorization in the form of a Galveston County purchase order from the Purchasing Agent's office prior to commitment to deliver supplies, materials, equipment, including contracts for repair, service, and maintenance agreements. Any commitments made without proper authorization from the Purchasing Agent's office, pending Commissioners' Court approval, may become the sole responsibility of the individual making the commitment including the obligation of payment.

Code of Ethics - Statement of Purchasing Policy:

Public employment is a public trust. It is the policy of Galveston County to promote and balance the objective of protecting the County's integrity and the objective of facilitating the recruitment and retention of personnel needed by Galveston County. Such policy is implemented by prescribing essential standards of ethical conduct without creating unnecessary obstacles to entering public office.

Public employees must discharge their duties impartially so as to assure fair competitive access to governmental procurement by responsible contractors. Moreover, they should conduct themselves in such a manner as to foster public confidence in the integrity of the Galveston County procurement organization.

To achieve the purpose of these instructions, it is essential that those doing business with Galveston County also observe the ethical standards prescribed here.

General Ethical Standards: It shall be a breach of ethics to attempt to realize personal gain through public employment with Galveston County by any conduct inconsistent with the proper discharge of the employee's duties.

It shall be a breach of ethics to attempt to influence any public employee of Galveston County to breach the standards of ethical conduct set forth in this code.

It shall be a breach of ethics for any employee of Galveston County to participate directly or indirectly in procurement when the employee knows that:

- The employee or any member of the employee's immediate family has a financial interest pertaining to the procurement.
- A business or organization in which the employee, or any member of the employee's immediate family, has a financial interest pertaining to the procurement.
- Any other person, business or organization with which the employee or any member of the employee's immediate family is negotiating or has an arrangement concerning prospective employment is involved in the procurement.

Gratuities: It shall be a breach of ethics to offer, give or agree to give any employee of Galveston County, or for any employee or former employee of Galveston County to solicit, demand, accept or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation of any part of a program requirement or purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any program requirement or a contract or subcontract, or to any solicitation or proposal therefore pending before this government.

Kickbacks: It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for Galveston County, or any person associated therewith, as an inducement for the award of a subcontract or order.

Contract Clause: The prohibition against gratuities and kickbacks prescribed above shall be conspicuously set forth in every contract and solicitation by Galveston County.

Confidential Information: It shall be a breach of ethics for any employee or former employee of Galveston County to knowingly use confidential information for actual or anticipated personal gain, or for the actual or anticipated gain of any person.

Questions/Concerns:
If you have any questions or concerns regarding the information or instructions contained within this packet, please contact any member of the Purchasing Department staff at **(409) 770-5371.**

CONFLICT OF INTEREST DISCLOSURE REPORTING

Proposer may be required under Chapter 176 of the Texas Local Government Code to complete and file a conflict of interest questionnaire (CIQ Form). If so, the completed CIQ Form must be filed with the County Clerk of Galveston County, Texas.

If Proposer has an employment or other business relationship with an officer of Galveston County or with a family member of an officer of Galveston County that results in the officer or family member of the officer receiving taxable income that exceeds $2,500.00 during the preceding 12-month period, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

If Proposer has given an officer of Galveston County or a family member of an officer of Galveston County one or more gifts with an aggregate value of more than $250.00 during the preceding 12-months, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

The Galveston County Clerk has offices at the following locations:

Galveston County Clerk
Galveston County Justice Center, Suite 2001
600 59th Street
Galveston, Texas 77551

Galveston County Clerk
North County Annex, 1st Floor
174 Calder Road
League City, Texas 77573

Again, if Proposer is required to file a CIQ Form, the original completed form is filed with the Galveston County Clerk (not the Purchasing Agent).

For Proposer's convenience, a blank CIQ Form is enclosed with this proposal. Blank CIQ Forms may also be obtained by visiting the Galveston County Clerk's website and/or the Purchasing Agent's website – both of these web sites are linked to the Galveston County homepage, at http://www.co.galveston.tx.us.

As well, blank CIQ Forms may be obtained by visiting the Texas Ethics Commission website, specifically at http://www.ethics.state.tx.us/whatsnew/conflict_forms.htm.

Chapter 176 specifies deadlines for the filing of CIQ Forms (both initial filings and updated filings).

It is Proposer's sole responsibility to file a true and complete CIQ Form with the Galveston County Clerk if Proposer is required to file by the requirements of Chapter 176. Proposer is advised that it is an offense to fail to comply with the disclosure reporting requirements dictated under Chapter 176 of the Texas Local Government Code.

If you have questions about compliance with Chapter 176, please consult your own legal counsel. Compliance is the individual responsibility of each person, business, and agent who is subject to Chapter 176 of the Texas Local Government Code.

COUNTY of GALVESTON
Purchasing Department

rev. 1.3, March 29, 2010

FORM PEID:	Request for Person-Entity Identification Data

Instructions: Please type or print clearly when completing sections 1 thru 4 and return completed form to:

Galveston County Purchasing Agent
722 Moody Avenue (21st. Street), 5th Floor
Galveston, Texas 77550
(409) 770-5371 *office*
(409) 621-7987 *fax*

1.

Business Name:	
Attention Line:	

2.

Physical Address:			
City:		State:	Zip+4:

3.

Billing / Remit Address:			
City:		State:	Zip+4

4.

Main Contact Person:	
Main Phone Number:	
Fax Number:	
E-mail Address:	

Areas below are for County use only.

Requested By:	Phone / Ext. #:
Department:	Date:

Action Requested - Check One:	IFAS PEID Vendor Number:	
( ) Add New	( ) Change Data	( ) Re-activate
( ) Inactivate	( ) Employee	( ) Attorney
( ) Landlord	( ) Foster Parent	( ) Refund
( ) One Time	( ) Foster Child	

Form **W-9**
(Rev. October 2007)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

Business name, if different from above

Check appropriate box: ☐ Individual/Sole proprietor ☐ Corporation ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶
☐ Other (see instructions) ▶

☐ Exempt payee

Address (number, street, and apt. or suite no.)

Requester's name and address (optional)

City, state, and ZIP code

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

or

Employer identification number

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here **Signature of U.S. person ▶** **Date ▶**

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,

- The U.S. grantor or other owner of a grantor trust and not the trust, and
- The U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person, do not use Form W-9. Instead, use the appropriate Form W-8 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity not subject to backup withholding, give the requester the appropriate completed Form W-8.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the instructions below and the separate instructions for the Requester of Form W-9.

Also see *Special rules for partnerships* on page 1.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name" line.

Limited liability company (LLC). Check the "Limited liability company" box only and enter the appropriate code for the tax classification ("D" for disregarded entity, "C" for corporation, "P" for partnership) in the space provided.

For a single-member LLC (including a foreign LLC with a domestic owner) that is disregarded as an entity separate from its owner under Regulations section 301.7701-3, enter the owner's name on the "Name" line. Enter the LLC's name on the "Business name" line.

For an LLC classified as a partnership or a corporation, enter the LLC's name on the "Name" line and any business, trade, or DBA name on the "Business name" line.

Other entities. Enter your business name as shown on required federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name" line.

Note. You are requested to check the appropriate box for your status (individual/sole proprietor, corporation, etc.).

Exempt Payee

If you are exempt from backup withholding, enter your name as described above and check the appropriate box for your status, then check the "Exempt payee" box in the line following the business name, sign and date the form.

Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

The following payees are exempt from backup withholding:

1. An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2),

2. The United States or any of its agencies or instrumentalities,

3. A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities,

4. A foreign government or any of its political subdivisions, agencies, or instrumentalities, or

5. An international organization or any of its agencies or instrumentalities.

Other payees that may be exempt from backup withholding include:

6. A corporation,

7. A foreign central bank of issue,

8. A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States,

9. A futures commission merchant registered with the Commodity Futures Trading Commission,

10. A real estate investment trust,

11. An entity registered at all times during the tax year under the Investment Company Act of 1940,

12. A common trust fund operated by a bank under section 584(a),

13. A financial institution,

14. A middleman known in the investment community as a nominee or custodian, or

15. A trust exempt from tax under section 664 or described in section 4947.

The chart below shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 15.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 9
Broker transactions	Exempt payees 1 through 13. Also, a person registered under the Investment Advisers Act of 1940 who regularly acts as a broker
Barter exchange transactions and patronage dividends	Exempt payees 1 through 5
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 7[2]

[1]See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2]However, the following payments made to a corporation (including gross proceeds paid to an attorney under section 6045(f), even if the attorney is a corporation) and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, and payments for services paid by a federal executive agency.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited liability company (LLC)* on page 2), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at *www.ssa.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting *www.irs.gov* or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: *A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.*

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, and 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). Exempt payees, see *Exempt Payee* on page 2.

Signature requirements. Complete the certification as indicated in 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account [1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor [2]
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee [1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner [1]
5. Sole proprietorship or disregarded entity owned by an individual	The owner [3]
For this type of account:	**Give name and EIN of:**
6. Disregarded entity not owned by an individual	The owner
7. A valid trust, estate, or pension trust	Legal entity [4]
8. Corporate or LLC electing corporate status on Form 8832	The corporation
9. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
10. Partnership or multi-member LLC	The partnership
11. A broker or registered nominee	The broker or nominee
12. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or "DBA" name on the second name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 1.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records from Identity Theft

Identity theft occurs when someone uses your personal information such as your name, social security number (SSN), or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

Call the IRS at 1-800-829-1040 if you think your identity has been used inappropriately for tax purposes.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS personal property to the Treasury Inspector General for Tax Administration at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: *spam@uce.gov* or contact them at *www.consumer.gov/idtheft* or 1-877-IDTHEFT(438-4338).

Visit the IRS website at *www.irs.gov* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons who must file information returns with the IRS to report interest, dividends, and certain other income paid to you, mortgage interest you paid, the acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA, or Archer MSA or HSA. The IRS uses the numbers for identification purposes and to help verify the accuracy of your tax return. The IRS may also provide this information to the Department of Justice for civil and criminal litigation, and to cities, states, the District of Columbia, and U.S. possessions to carry out their tax laws. We may also disclose this information to other countries under a tax treaty, to federal and state agencies to enforce federal nontax criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism.

You must provide your TIN whether or not you are required to file a tax return. Payers must generally withhold 28% of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to a payer. Certain penalties may also apply.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information in this section is being disclosed.**

_____

Name of Officer

This section (item 3 including subparts A, B, C, & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more?

☐ Yes ☐ No

D. Describe each employment or business and family relationship with the local government officer named in this section.

4

_____

Signature of vendor doing business with the governmental entity

_____

Date

County of Galveston

ACKNOWLEDGMENT AND CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER INELGIBILITY

Executive Orders 12549 & 12689 Certification, Debarment and Suspension

Solicitation Number: RFP #B171023

Solicitation Title: CDBG Round 2.2 Cowart Creek Tributary Two Drainage Project

Contractor hereby CERTIFIES that:

Contractor, and all of its principals, is not presently debarred, suspended, proposed for debarment, proposed for suspension, or declared ineligible under Executive Order 12549 or Executive Order 12689, Debarment and Suspension, and is not in any other way ineligible for participation in Federal or State assistance programs;

Contractor, and all of its principals, were not and have not been debarred, suspended, proposed for debarment, proposed for suspension, or declared ineligible under Executive Order 12549 or Executive Order 12689, Debarment and Suspension, and were not and have not been in any other way ineligible for participation in Federal or State assistance programs at the time its' proposal was submitted in the procurement identified herein and at any time since submission of its' proposal;

Contractor has included, and shall continue to include, this certification in all contracts between itself and any sub-contractors in connection with services performed under this contract; **and**

Contractor shall notify Galveston County in writing immediately, through written notification to the Galveston County Purchasing Agent, if Contractor is not in compliance with Executive Order 12549 or 12689 during the term of its contract with Galveston County.

Contractor **Represents** and **Warrants** that the individual executing this Acknowledgment and Certification on its behalf has the full power and authority to do so and can legally bind the Contractor hereto.

Name of Business	Date
By: Signature	Printed Name & Title