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.

1.4 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.

1.4 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..

1.4 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 03000 – 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.

1.4 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 02620
STORM SEWER LINE CLEANING AND TELEVISING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Cleaning of Storm Sewer Lines of foreign materials and complete a closed-circuit television (CCTV) inspection of all lines and facilities in this project to include all the equipment, labor and materials necessary to perform all work for sewer line cleaning and televising.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:
   1. No separate payment shall be made outside of those listed in Document 00300-Unit Price Bid Form.
   2. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. CFTS – City of Friendswood Technical Specifications.
B. NASSCO – National Association of Sewer Service Companies.
   1. Jetter Code of Practice.
   2. Pipe Line Assessment and Certification Program (PACP).
   3. TV inspection form and sewer condition codes.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.
B. The Contractor shall submit all manufacturer's brochures and specifications for the cleaning equipment.
C. Methods of cleaning and clearing lines shall submit for review and approval by the Project Manager.
D. The Contractor shall provide a safety plan and identify designated safety supervisory personnel. The plan shall include confined space entry provisions and training, listing of personnel protective equipment (PPE), and a Traffic Control Plan (TCP).
E. CCTV Technician NASSCO PACP Certification – The Contractor shall provide certification documentation for all technicians on this project.

1.5 QUALITY ASSURANCE

A. The Contractor shall comply with all codes, laws, ordinances and regulations of the governmental authorities having jurisdiction over this work.
B. The Contractor shall comply with the latest revision of the Occupational Safety and Health Administration manuals for construction and confined spaces.

D. The storm sewer line cleaning shall remove foreign materials from the lines and restore the sanitary sewer to a minimum of ninety-five percent (95%) of the original carrying capacity or as required for proper seating of an internal pipe line. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, the Contractor shall immediately notify the Project Manager and the Contractor shall not be required to clean that section of pipe.

1.6 COORDINATION

A. The Contractor shall completely remove and dispose of all dirt, rubbish and surplus, and unsuitable materials at the end of each work day at no additional cost to the City and in accordance of Section 01580 – Waste Material Disposal.

B. The Contractor shall be allowed to use the City water supply for filling the tanks. The Contractor shall go to the Public Works Department and obtain, by leaving a deposit, a meter for fire hydrants. There shall be no charge for the water used during this operation. There shall be either an RPZ or and an air gap for filling of the tanks. All filling operations are to be reviewed by the Project Manager.

PART II: PRODUCTS

2.1 HIGH VELOCITY JET (HYDRO CLEANING) EQUIPMENT

A. All high-velocity sanitary sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two (2) or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from fifteen degrees (15°) to forty-five degrees (45°) in all sizes of pipe designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floors. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, hydraulically driven hose reel and recovery tank.

1. The equipment shall have a minimum of six hundred feet (600 Ft) of one inch (1 In) I.D. high pressure hose.
2. The nozzles shall have a capacity of sixty gallons per minute (60 GPM).
3. The minimum working pressure shall be one thousand pounds per square inch (1000 psi).

2.2 CCTV EQUIPMENT

A. The CCTV digital cameras used for inspection shall be specifically designed and constructed for such inspection. The cameras shall be operative in one hundred percent (100%) humidity conditions and

capable of withstanding exposure to concentrations of pollutants typically found in sewage.

B. The view seen by the camera shall be transmitted to a monitor greater than or equal to (≥) fifteen inches (15") as measured on a diagonal dimension.

C. The view seen by the camera shall be transmitted to a monitor greater than or equal to (≥) fifteen inches (15") as measured on a diagonal dimension.

D. Camera systems shall be able to navigate minor objects, roots, and debris. The system used to move the camera through the storm sewer pipes shall not obstruct the camera's view or interfere with the proper documentation of the storm sewer conditions. The camera shall be capable of traversing the storm sewer line for a minimum distance of one thousand feet (1,000').

E. The Contractor shall provide all ancillary wheels, crawlers, tracks, or other adjustment plates, skids, arms, axles, etc. as may be necessary or dictated by flow conditions, pipe diameter, etc. These accessories shall be utilized to stabilize the camera in the pipeline, provide adequate propulsion in the pipeline for the camera, and/or to raise the camera above the flow to provide a quality picture during CCTV inspection.

F. Cameras shall record all images digitally in color. Cameras shall have pan and tilt capabilities and shall have a minimum of three hundred sixty-degree (360º) by one hundred eighty-degree (180º) rotation capability. Illumination sensitivity shall be three (3) lux or less and provide a minimum of four hundred sixty (460) lines of resolution. The focal distance shall be an adjustable range from one inch (1") to infinity. There shall be no geometric distortion of image.

G. Cameras shall also provide ancillary or supplemental lighting packs or units to provide sufficient light and illumination in larger diameter pipes or pipes where additional lighting may be necessary. Lighting intensity shall be adjustable to minimize glare. Lighting and picture quality shall be adjustable to provide a clear picture of the entire periphery of the pipeline for all conditions encountered.

H. The distances traveled by the camera shall be measurable to one-tenth of a foot (0.1') by an onboard measuring device and shall provide video display readout of said distances in units of one-tenth of a foot (0.1'). The cable footage counter shall be accurate to plus or minus one foot (±1.0') per one hundred feet (100').

2.2 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 Contractor.
e. Date Televised.

2. The following information shall be recorded and visible on screen for ten seconds (10s) immediately before the start of televising each segment:
   a. Project Name.
   b. Project Number.
   c. Upstream manhole number designation.
   d. Downstream manhole number designation.
   e. Pipe Material.
   f. Pipe Size.
   g. Name of 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-hand corner of the screen.
4. Video shall be formatted as Window Media Video v9 (.WMV) with a minimum compression of one (1) mb/sec, a resolution of six hundred forty (640) by four hundred eighty (480), and a NTSC format.

PART III: EXECUTION

3.1 CLEANING PRECAUTIONS

A. During storm sewer cleaning operations, satisfactory precautions shall be taken in the use of the cleaning equipment to ensure that the water pressure does not create damage to public or private property. Extraordinary care shall be taken to prevent the nozzle from causing damage to people, vehicles or other property that are in the vicinity of or around the equipment.

B. The Contractor shall be responsible to make notification to all residents and businesses with back-yard or side-yard storm sewer systems where work will be taking place. Notifications shall be no less than forty-eight (48) hours nor no more that two (2) weeks prior to commencing work.

3.2 STORM SEWER LINE CLEANING

A. Water required for jetting and cleaning shall be furnished by the City at no charge, however the Contractor shall be required to supply a deposit for the fire hydrant meter. The Contractor shall provide a backflow protection device to prevent cross contamination of the City's water distribution system.

B. The designated storm sewer sections shall be cleaned using high-velocity jet equipment. The equipment shall be capable of removing roots, dirt, grease, sand, rocks and other materials and obstructions from

storm sewer lines and manholes. There shall be a debris catcher on the downstream manhole. If cleaning of an entire section cannot be successfully performed from one (1) manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If again successful cleaning cannot be performed or the equipment fails to transverse the entire section, it shall be assumed that a major blockage exists, and the cleaning effort shall be abandoned after notification to and approval by the Project Manager.

C. The Contractor shall dewater and remove all sludge, dirt, sand, rocks, and other solid material and debris resulting from the cleaning operations from the downstream segment being cleaned.
D. Passing material from sewer segment to sewer segment shall not be permitted.
E. All removed material shall be dumped at an acceptable and approved location to receive the waste. The Contractor shall be responsible for all handling, hauling, and disposal of all debris, silt, and other accumulated solids removed from the storm sewers. All loads SHALL be weighed, and weigh tickets given to the Project Manager for verification.
F. Cleaning of Storm Sewer lines from the last manhole to outfall shall be done in such a manner that the debris, silt, etc. shall not fall into detention ponds, drainage swales, or waterways.

3.2 ROOT REMOVAL

A. All roots (with the exception of “fine roots” as defined in PACP) shall be cut to within one inch (1”) or closer of the pipe wall.
B. All lines requiring root cutting shall have roots cut by mechanical means from the downstream manhole to the mass. No “reverse cutting” from the upstream side shall be permitted.
C. Televising may be stopped, and root cutting executed while the video recording is paused.
D. Storm Sewer Structures are not required to be inspected as part of the contract, however the Contractor shall make note and communicate to the Project Manager any structure appearing to be structurally deficient which may cause a safety hazard or flooding risk.

3.4 MATERIAL REMOVAL

A. Sludge, dirt, rocks, sand, grease, roots and other solid or semi-solid material resulting from cleaning operation shall be captured and removed at the downstream manhole of the section being cleaned, loaded in a suitable container, transported to the nearest wastewater treatment facility and disposed of at that facility in accordance with all requirements and charges and as specified in Section 01580 – Waste Material Disposal.
B. UNDER NO CIRCUMSTANCES SHALL SEWAGE OR SOLIDS OR ANY OTHER TYPE OF WASTE MATERIAL FROM THIS OPERATION THAT HAS BEEN REMOVED FROM THE CITY STORM SEWER SYSTEM,

BE DUMPED ONTO STREETS OR INTO DITCHES, CATCH BASINS, STORM DRAINS, EXISTING SANITARY SEWER MANHOLES, ON THE GROUND OR INTO STREAMS.

3.5 CLEANING WATER DISPOSAL

A. Water used to clean the sewer lines shall be discharged into the sanitary sewer system downstream of the cleaning operation or as otherwise directed by the Project Manager.

B. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR DISCHARGE WATER USED TO CLEAN THE SEWER LINES ONTO STREETS OR INTO DITCHES, CATCH BASINS, STORM DRAINS, EXISTING SANITARY SEWER MANHOLES, ON THE GROUND OR INTO STREAMS. Water discharge shall only be allowed to downstream manholes.

3.7 FINAL ACCEPTANCE

A. Acceptance of storm sewer line cleaning shall be made upon completion of the television inspection Storm Sewer Lines. The DVD media and reports shall be reviewed and approved by the Project Manager. Any television inspection that shows the cleaning to be unsatisfactory shall require the process of re-cleaning and re-inspecting to be repeated until the sanitary sewer line cleaning is satisfactory to the Project Manager. Re-cleaning and re-inspection shall be done at no additional cost to the City.

END OF SECTION