

# Special Specification 7201

## Sanitary Sewer



### 1. DESCRIPTION

#### 1.1. Scope of Work.

Provide and install complete sanitary sewer construction and adjustments in conformity with the details shown on the plans, as described and in compliance with the Department's Utility Accommodation Policy (UAP)(Title 43, T.A.C., Sections 21.31-21.55) or as directed.

Reference specifications of the American Society for Testing and Materials (ASTM), American Water Works Association (AWWA) and American National Standards Institute (ANSI) will mean the latest standard in effect on the date of the proposal.

#### 1.2. Other Utilities.

The data furnished on the plans regarding the size and location of all other utility lines has been obtained from field surveys, the City and the various utility companies. The Department does not assume responsibility for the accuracy of the information presented nor does it warrant that all of the utility lines have been shown.

#### 1.3. Definitions.

**Sanitary Sewer Main.** Sanitary Sewer Main is defined as that portion of the sanitary sewer system which collects the effluent from the service laterals, including stub outs from the nearest manhole, to the point of final destination.

1.3.1. **Service Lateral.** Service Lateral is defined as that portion of the sanitary sewer system beginning at a customer property line or other establishment property line which is the point of origin of the effluent being carried by the system to the sanitary sewer main, including the connection into the sanitary sewer main system.

1.3.2. **Television Inspection.** Television Inspection is defined as furnishing all labor, materials, equipment, tools, logging and incidentals necessary to provide the televising and videotaping of sewer lines utilizing a color closed circuit television inspection unit to determine the condition of the lines.

All new sewer mains will not carry flow until the Engineer approves and accepts the mains for service.

1.3.3. **By-Pass Pumping.** By-Pass Pumping is defined as furnishing all labor, materials, equipment, tools, appliances and incidentals necessary to perform all operations in connection with by-pass pumping of sewage flow for the purpose of preventing interference with the construction of the sanitary sewer manholes and mains as well as providing reliable sewer service to the areas being served.

The Contractor will be required to provide adequate pumping equipment and force mains to maintain reliable sanitary sewer service in all sanitary sewer lines involved. In case of equipment failure, have on-the-jobsite backup pumps and force mains. Under no circumstances must the flow be interrupted or stopped such that damage is done to either private or public property; or sewage flows or overflows into a storm sewer or natural waterway.

Provide by-pass pumping of sewage around each segment of pipe that is to be televised or replaced. The Contractor is responsible for all required bulkheads, pumps, equipment, piping, and other related

appurtenances to accomplish the sequence of pumping. A qualified person must man the pumps, on-site, at all times during the by-pass procedure.

All piping, joints and accessories must be designed to withstand the maximum by-pass system pressure, or a minimum of 50 psi, whichever is greater. During by-pass pumping, no sewage must be leaked, dumped, or spilled in or onto any area outside of the existing sanitary sewer system. When by-pass pumping operations are complete, all piping must be drained into the sanitary sewer before disassembly.

---

## 2. MATERIALS

All materials furnished for this project will be new. A manufacturer's certificate of compliance will be acceptable for quality control.

### 2.1. Sanitary Sewer Pipe.

Materials for sanitary sewer pipe must be of the specific type that is called for on the plans. Install materials as specified by the manufacturer.

#### 2.1.1. Rigid Pipe.

Reinforced concrete, ductile-iron pipe, cast iron pipe, and concrete steel cylinder pipe, for the purpose of this Item, will be known as rigid pipe.

#### 2.1.2. Flexible Pipe.

Pipe consisting of materials other than those listed above.

##### 2.1.2.1. Any flexible conduit with a deflection of the inside diameter greater than 5 percent after installation, will not be accepted. A Go, No-Go deflection Testing Mandrel will be furnished, built and used in testing pipe deflection for acceptance, in accordance with the detail drawing as shown on the plans, unless directed otherwise.

The working room for flexible pipe must be a minimum of 6 in. Pipe stiffness is to be in accordance with ASTM 3034 SDR 26 [115 psi] or ASTM 2241 SDR 26 [160 psi].

#### 2.1.3. Fiberglass Reinforced Sewer Pipe, Non-Pressure Type.

Fiberglass reinforced sewer pipe, non-pressure type, must be a factory-formed conduit of polyester resin, continuous roving glass fibers and silica sand built up in laminates and must conform to the requirements of ASTM D-3262 including the appendix and subsequent specifications, and accordance to CITY OF BOERNE material specifications.

##### 2.1.3.1. Coupling Joints. Joints for pipe and fittings must be confined compression rubber gasket bell and spigot type joints conforming to the material and performance requirements of ASTM D-4161.

##### 2.1.3.2. Fittings. Flanges, elbows, reducers, tees, wyes, laterals, and other fittings must be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber reinforced overlays. For pipes 15" or larger in diameter, lateral openings 6 in. or greater in size must be made using PVC sewer saddles conforming to ASTM D-2661 or Insert Tee connections conforming to ASTM D-3034 or approved equal minimum pipe stiffness must not be less than 150 psi for direct bury applications.

#### 2.1.4. PMS PVC Pipe.

Poly Vinyl Chloride (PVC) pipe will be made from class 12454-B materials as prescribed in ASTM D-1784. For pipes 4" to 15" in diameter PMS pipe, fittings and joints must conform to ASTM D-3034 and D-3212 as

well as ASTM D-2241 and ASTM D-3139 where applicable, with the exception that solvent cement joints must not be used. All pipe that is 18" to 27" in diameter must meet requirements of ASTM F-679.

- 2.1.4.1. Water Main Crossings. Gravity or force main sewers constructed in the vicinity of water mains will comply with the requirements of the "Criteria for Domestic Wastewater Systems," 30 TAC 217.53, as adopted by The Texas Commission on Environmental Quality August 28, 2008.

Mechanical or compression joints, concrete jointing collars, or non-reinforced rubber adaptors must be used only as approved by the Owner.

2.1.5. **Steel Casing Pipe.**

The component materials, manufacture and testing of all steel pipe will conform to AWWA Standard C-200 for "Steel Water Pipe 6 in. and Larger." The specified pipe size will be the actual inside diameter of the pipe, special or fitting in in. The diameter and wall thickness of all steel pipe will conform to those shown on the plans.

Pipe will be either Grade A or Grade B, conforming to ASTM Designation A-53.

Pipe ends will be beveled and suitable for field butt welding except as otherwise specified.

Pipe will receive a protective coating conforming to AWWA Standard C-203, "Coal-Tar Protective Coatings and Linings for Steel Pipelines – Enamel and Tape Hot Applied."

Pipe length will be nominal 40 ft. lengths except for specials or as otherwise specified on the plans. Standard and specials will be within 1/16 in. (plus or minus) of the specified or theoretical lengths.

2.1.6. **Stainless Steel Casing Spacer.**

The Casing Spacers are to be constructed of T-304 stainless steel segments which bolt together forming a shell around the carrier pipe. The spacers are to be designed with risers (when needed) and runners to support the carrier within the casing and maintain a minimum clearance of 0.50 in. between the casing ID and the spacer OD. On carrier pipes with an OD less than 16 in., each spacer is to have four (4) riser and runner combinations - two (2) on each segment. On carrier pipes with an OD of 16 in. and larger, each spacer is to contain six (6) riser and runner combinations - four (4) on the bottom segment and two (2) on the top segment. T-304 stainless steel bolts and nuts are to be supplied with the spacers.

The band is to be manufactured of 8 in. wide, 14 gauge, T-304 stainless steel material. The risers are to be constructed of 10 gauge, T-304 stainless steel with a minimum length of 6 in.

Abrasion resistant runners, with a minimum length of 7 in. and a minimum width of 1 in. are to be attached to each riser to minimize friction between the casing pipe and the carrier pipe as it's installed. Runner material is to be of glass reinforced plastic with compression strength of 25,000 psi, flexural strength of 32,000 psi and tensile strength of 22,000 psi. The ends of all runners are to be beveled to facilitate installation over rough weld beads or the welded ends of misaligned or deformed casing pipe.

Interior surfaces of the circular steel shell are to be lined with PVC or EPDM with a minimum thickness of 0.090 in. with a hardness of durometer "A" 85-90.

Spacers will be placed a maximum of 1 ft. on each side of the bell joint and every 8 to 12 ft. apart thereafter.

2.1.6.1. Physical Properties

2.1.6.1.1. Band and Risers

- Band - 14 Gauge, T-304 Stainless Steel
- Riser - Minimum 14 Gauge, T-304 Stainless Steel

- 2.1.6.1.2. Liner - EDPM or Polyvinyl Chloride
- Thickness - 0.090 in. minimum
  - Hardness - Durometer "A" 85-90
  - Dielectric Strength - 1/8 in. thick
  - 60,000 VPM
  - Water Absorption - one (1) percent maximum
  - Overlap edges

- 2.1.6.1.3. Studs, Nuts and Washers
- T-304 Stainless Steel - 5/16: - 18 in. x 2 in. studs
  - 5/16 in. hex nuts
  - 5/16 in. washers SAE 2330

2.1.6.1.4. Runners

1 in. wide or 2 in. wide glass filled polymer runners

Sizes Available:

Length - 7 in.

Effective heights (all lengths) - 1 in. and 1 1/2 in.

Materials Specifications:

Tensile Strength (ASTM D-638) - 22,000 psi

Flexural Strength (ASTM D-790) - 32,000 psi

Compression Strength (ASTM D-695) - 25,000

Deflection Temperature @ 264 psi (ASTM D-648) - 435 F (224 C)

Deformation Under Load, @ 122 F (50C) - 4000 pound Load, - (ASTM D-648) 1.2 percent.

- 2.1.6.1.5. Welding. All risers are to be welded by MIG welding. Welds are to be fully pasivated.

2.2. **Manholes.**

Material for manholes will conform to the requirements of Item 465, "Manholes and Inlets," as described below and as shown on the plans.

2.2.1. **Manhole Structures.**

Cast in place concrete structures or pre-cast concrete structures, as detailed on the plans, will be installed where any pipe intercepted is larger than 24 in. in diameter.

2.2.2. **Pre-Cast Reinforced Concrete Manhole Sections.**

Manhole sections are to conform to the requirements of ASTM Designation C-478. The pre-cast sections will have rubber gasket compression joints conforming to the material and performance requirements of ASTM C-443.

2.2.3. **Monolithically Poured Concrete Manholes.**

A minimum of two and a maximum of six throat rings must be used at each manhole for adjustability. All concrete for manholes must conform to the provisions of "Concrete (Class "A")," Item No. 421, Hydraulic Cement Concrete. All reinforcing steel must conform to the provisions of "Reinforcing Steel," Item No. 440 – Reinforcing Steel.

#### 2.2.4. **Throat Rings.**

Grade adjustment rings must be made of reinforced concrete conforming to ASTM C478. Inside diameter of rings to match manhole frame and cover. A minimum of two rings, resulting in 2 in. thickness, and a maximum of 4 rings, resulting in a thickness of 12 in., must be used to meet final grade. Seals of pre-molded butyl rubber will be placed between rings and between rings and manhole section. Pre-cast cone, throat rings and ring and cover sections of manholes will be sealed using internal rubber seals described below.

#### 2.2.5. **Rings and Covers.**

Materials for rings and covers will conform to the requirements of Item 471, "Frames, Grates, Rings and Covers." The rings and covers will be cast iron as manufactured by Trans-Tex Supply Company, No. A-77 (400 pounds) or equal to the dimensions shown on plans. Covers are to contain no holes or openings. Provide lifting bars with slots cast into the covers. Rings and covers must have a 30 in. (min.) opening per 30 TAC 217.55 (L) (I) A.

2.2.5.1. Watertight manhole rings and covers, when designated on the plans, are to be cast iron as manufactured by Trans-Tex Supply Company, No. A-77 O.R. (Watertight) (400 pounds) or approved equal. Covers are to contain no holes or openings except as required for bolts. Lifting bars with slots adequate for pick insertion and cast into the covers are to be provided for lifting purposes. Covers are required to seat on a minimum 5/16 in. diameter rubber ring gasket conforming to the material requirements of ASTM Designation C-443. The rubber gasket is to rest in a groove cast in the ring. A minimum of four (4), 5/8 in. diameter stainless steel, hex head bolts will be provided for each cover. The four (4) bolt holes in the covers will be evenly spaced and provided with minimum 1-1/2 in. diameter counter sinks for the bolt heads. On the fastened and bolted position the bolt heads will not extend beyond the surface of the cover. Gaskets of a size and material, as approved will be provided for the bolts to insure water tightness. Alignment marks will be cast onto watertight rings and covers for proper bolt alignment.

2.2.5.2. All finished frames and covers will have the bearing surfaces machine ground and sets of rings and covers will be marked in such a way that they can be matched for assembly in the field. All covers will have the words "Sanitary Sewer" cast thereon or as specified in the details.

#### 2.2.6. **Chimney Seals**

External seals must consist of a corrugated rubber sleeve conforming to ASTM C9233 with a min. thickness of 3/16 in. and compression band consisting of a single assembly of 16 GA. Type 304 stainless steel meeting ASTM A240, min. 1 in. wide. The band length will provide diameter adjustment a minimum of 4 in. of greater than manhole chimney diameter. Band will be secured with 304 stainless steel conforming to ASTM F593 and F594 fasteners.

Internal seals must be made of double pleated rubber conforming to ASTM C923, minimum 3/16 in. thick, and allow for a minimum vertical expansion of 2 in. Expansion bands will consist of a single assembly of 16 GA. Type 304 stainless steel meeting ASTM A240, min. 1 3/4 in. wide. The band length will provide diameter adjustment a minimum of 2 in. of greater than manhole chimney diameter. Band will be secured with 304 stainless steel conforming to ASTM F593 and F594 fasteners.

#### 2.2.7. **Coating**

After all structures have been constructed or rehabilitated, and all testing has passed, they must be made watertight by the application of approved sewer coatings.

Interior coating must consist of both prime and finish coat. After voids, bugholes and other flaws are filled, prime coat must consist of a 1/32 to 1/4 in. thick application of Series 218 MortarClad Epoxy Modified Mortar. Application will result in a smooth, uniform surface for finish coat treatment. Finish coat will consist of 1 or 2 coats of Series 436 Perma-Shield FR Fiber-Reinforced Modified Polyamine Epoxy resulting in 50 to 125.0 mils thickness DFT.

Exterior coatings must consist of a single prime coat of Series N69 Hi-Build Epoxoline II Polyamidoamine Epoxy Coating with an allowable application range of 3.0 to 5.0 mils thickness and a single finish coat of Series 46H-413 Hi-Build Tneme-Tar Polyamide Coal Tar Epoxy Coating with an allowable application range of 14.0 to 20.0 mils thickness. Combined exterior coating will result in a total of 17 to 25.0 mils thickness DFT.

2.3. **Concrete.**

All concrete is to meet the requirements of Item 421, "Hydraulic Cement Concrete." Unless otherwise shown on the plans or required by this specification, all concrete will be Class A.

2.4. **Reinforcing Steel.**

Reinforcing steel and the placing thereof is to conform to the requirements of Item 440, "Reinforcing Steel," except where welded wire is called for on the plans, the material will be welded wire flat sheets meeting ASTM. A-185. Welded wire rolls will not be used.

2.5. **Cement Stabilized Backfill.**

2.6. Cement stabilized backfill is to be in accordance with Item 400, "Excavation and Backfill for Structures."

2.7. **Flowable Backfill.**

When indicated on the plans, the trench is to be backfilled to the dimensions shown with flowable backfill. The flowable backfill with fly ash will be Mix Design Type B in accordance with Item 401, "Flowable Backfill," or an acceptable mix as approved.

2.8. **Non-shrink, Non-metallic Grout.**

Grout must be Sika "SikaGrout212", Glifford Hill "Supreme Grout", Master Builders "Masterflow 713" or approved equal.

2.9. **Pipe Couplings.**

Non-pressure rated connections must use sleeve type couplings made of shielded rubber or elastomeric bushings conforming to ASTM C1173. Shields will be made of 300 stainless steel with minimum thickness of .012". Couplings to be fastened using 316 stainless steel band clamps. Pipe 6 in. and greater in diameter require a minimum of two clamps at each connection.

2.10. **Sewer Main Television Inspection.**

Furnish all labor, materials, equipment, and incidentals to provide the televising and a NASSCO-(PACP) standard video, recorded in MPEG-1 format and written to DVD video of sewer lines and manholes utilizing a color, closed-circuit television inspection unit to determine their condition.

Provide a line diagram area sketch and written log for each completed segment of DVD sewer main describing the section being televised, flow and camera direction, position of service connections, description and location of failures, pipe condition, weather conditions, and other significant observations.

Television inspection must be done one manhole section at a time. Also the flow in the section being televised must be by-passed if the line is in service and the flow exceeds 25% of the internal pipe diameter. When the depth of flow at the upstream manhole of the manhole section being worked is above the maximum allowable for television inspection, the flow must be reduced to allowable levels by temporarily plugging or blocking the flow or by-pass pumping.

Floating the camera will not be allowed. There may be occasions during the televised inspection of a manhole section when the camera will be unable to pass an obstruction. At that time, and before proceeding, contact the Inspector. If the length of sewer line cannot be televised because of obstructions, clean the system as is necessary. If, in the opinion of the Inspector, the obstruction is attributed to a collapsed main or pipe deflection, televising must be suspended, payment will be made based on the actual televised length, and the remaining televising of the sewer line will be continued upon successful correction of the blockage by the Contractor at his expense. No additional payment will be made for additional setups required due to obstructions encountered during televising.

#### 2.10.1. **Log Formats.**

Each DVD will be permanently labeled with the following:

- Project Name,
- Date Televised,
- Station to Station Location and Size of Sanitary Sewer,
- Street or Easement Location,
- Name of Contractor,
- Date DVD Submitted, and
- DVD Numbers.

#### 2.10.2. **Videotape Quality.**

If the Contractor produces a DVD of such poor quality that the Engineer is unable to evaluate the condition of the sanitary sewer main or locate the sanitary sewer service lateral connections, the Contractor will be required to re-televising the sanitary sewer main and provide a new DVD of good quality at no additional cost.

#### 2.10.3. **Equipment Required For TV Inspections.**

The Contractor will be required to have all materials, equipment and labor necessary to complete all videotaping on jobsite before isolating the sewer manhole segment and beginning videotaping operations. A camera with rotating or panning lens capabilities is required. The television inspection equipment must have an accurate footage counter which displays on the monitor the exact distance of the camera from the center of the starting manhole. A camera with rotating and panning lens capabilities is required. The camera height must be centered in the conduit being televised. The speed of the camera through the conduit must not exceed 40 ft. per min.

The television unit must also have the capability of displaying in color, on DVD, pipe inspection observations such as pipe defects, sags, points of root intrusion, offset joints, service connection locations, and any other relevant physical attributes.

#### 2.10.4. **DVD Logs.**

The Contractor is to provide, with each completed DVD, a TV inspection report which is a written log of all pipe defects, sags, points of root intrusion, offset points, service connection locations and condition recorded on a footage basis. This log is to also denote the section being televised, flow and camera direction, position of taps or failures, pipe condition and weather conditions.

2.11. **By-Pass Pumping.**

Provide and maintain adequate pumping equipment, force mains and other necessary appurtenances to maintain reliable sanitary sewer service in all sanitary sewer lines as required for construction. Backup pumps, force mains, and appurtenances must be available and ready to deploy immediately. Appurtenances and discharge point must be approved by the Inspector.

Any spillage, backups or overflows, etc. as the result of inadequate equipment are the sole responsibility of the Contractor.

Demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24 hr. before beginning the work.

The Contractor is required to have all materials, equipment and labor necessary to complete the repair or replacement on the jobsite before isolating the sewer manhole or line segment and beginning by-pass pumping operations.

2.12. **Warning Tape.**

Tape to consist of min. 3.5 mils thick, 6 in. wide polyethylene film with a traceable, metallic core and a minimum tensile strength of 1750 psi. Tape will be marked continuously with black letters on a green background stating "CAUTION: SANITARY SEWER BURIED BELOW" or "CAUTION: FORCE MAIN BURIED BELOW" as applicable.

2.13. **Bedding and Backfill.**

Backfilling for sanitary sewers is divided into three (3) separate zones: (a) bedding: the material in trench bottom in direct contact with the bottom of the pipe; (b) initial backfill: the backfill zone extending from the surface of the bedding to a point 1 ft. above the top of the pipe; and (c) secondary backfill: the backfill zone extending from the initial backfill surface to the top of the trench. Materials and placement for each of the zones are as described in the following:

2.13.1. **Bedding.**

2.13.1.1. Bedding Material:

The existing material at the bearing level must be removed and replaced to a minimum depth of 6 in. or 1/8 of the outside diameter of the pipe, whichever is greater, with bedding material. The bedding material must extend up the sides of the pipe enough to embed the lower quadrant of the pipe. The bedding material must be composed of well-graded, crushed stone or gravel conforming to the following requirements unless modified by the Engineer:

<u>Sewer Gravel</u>	<u>Percent</u>
Passing 1/2 in. sieve	100
Passing 3/8 in. sieve	95 – 100
Passing No. 4 sieve	20 – 80
Passing No. 10 sieve	0 – 25
Passing No. 20 sieve	0 – 2

2.13.2. Payment for additional excavation must be approved by the Inspector.

2.13.3. Initial Backfill: Initial backfill must consist of gravel which conforms to the requirements for bedding material.

- 2.13.4. Secondary Backfill: Secondary backfill must generally consist of materials removed from the trench and must be free of brush, debris and trash. Rock or stones with a dimension larger than 2.5 in at the largest dimension must be sifted out and removed before the material is used in the secondary backfilling zone. Secondary backfill material must be primarily composed of compactable soil material.
- 2.14. **Valves.**
- 2.14.1. **Plug Valves.**
- Plug valves must conform to AWWA C-517 and be non-lubricating, eccentric type with elastomer (nitrile) covered seating surfaces designed for minimum working pressure of 150 psi. Valves will have round port design.
- 2.14.1.1. Valves will have mechanical joint ends.
- 2.14.1.2. Valve actuators should be worm and gear with 2" nuts. Buried valves should include actuator nut extension to not more the 2 ft. below grade. Valve actuator to open counter-clockwise (left).
- 2.14.1.3. Valve bodies and plugs must be ASTM A-536 Grade 65-45-12 ductile iron. The body will be equipped with a min. 1/8" overlay of 99% nickel in accordance with AWWA 517.

### **3. CONSTRUCTION METHODS**

#### **3.1. Excavation.**

Excavation as required to complete the work as outlined herein will be performed in accordance with Item 400, "Excavation and Backfill for Structures."

#### **3.2. Trench Excavation Protection.**

Excavation greater than 5 ft. in depth is to be protected as specified in Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring."

#### **3.3. Trenching.**

Trench walls must be vertical. The practice of undercutting at the bottom or flaring at the top will not be permitted except where it is justified for safety and with the Engineer's or Inspector's approval. In special cases, where trench flaring is required, the trench walls must remain vertical to a depth of at least 1ft. above the top of the pipe.

The trench bottom must be square or slightly curved to the shape of the trenching machine cutters. The trench must be accurately graded along its entire length to provide uniform bearing and support for each section of pipe installed upon the bedding material. Bell holes and depressions for joints must be dug after the trench bottom has been graded and bedding installed. The pipe must rest upon the new bedding material for its full length.

Where over-excavation occurs, the under-cut trench must be restored to grade at the Contractor's expense by replacement with a material conforming to the requirements of the bedding material or a material approved by the Engineer.

##### **3.3.1. Width of Trench.**

Minimum Width of Trench. Excavate to width that accommodates free working space.

**Maximum Width of Trench.** The maximum allowable width of trench for pipelines measured at the top of the pipe must be the outside diameter of the pipe (exclusive of bells or collars) plus a maximum of 18 in. for pipes 33 in. in diameter and smaller or a 24 in. for pipes 33 in. in diameter or greater.

3.3.2. **Grade of Trench Bottom.**

The trench is to be over-excavated to a depth of 6 in. below the grade line established for the bottom of the pipe, regardless of the type of pipe. The grade line of the pipe is to then be met by the addition of a layer of approved bedding material as directed.

3.3.3. **Excavation Below Grade.**

Any part of the bottom of the trench excavated below the limits specified in Section 3.3.2. "Grade of Trench Bottom," is to be corrected with approved material and compacted as directed. Should excessive over-excavation occur, except at bell holes, the grade is to be restored in accordance with the methods described in Section 3.3.4, "Unstable Conditions at Grade."

3.3.4. **Unstable Conditions at Grade.**

Where the bottom of the trench at grade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable or other organic material, or large pieces of fragments or inorganic materials which in the judgment of Engineer should be removed, the Contractor is to excavate and remove such unsuitable material to the a depth at least 6 in. below pipe. Before the pipe is laid the grade is to be restored by backfilling with an approved material in layers of 3 in. before compaction. The layers are to be slightly moistened and thoroughly compacted so as to provide a uniform and continuous bearing and support for the pipe at every point between bell or collar holes. The finished grade is to be accurately graded to provide uniform bearing and support for each section of pipe at every point along its entire length except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper seating of pipe joints.

3.4. **Bedding and Backfill.**

Before laying the pipe, the normal or select bedding material will be shaped to conform to the outside diameter of the pipe as shown on the plans. Bedding material must be consolidated to assure it is incorporated from the bottom of the trench up to the pipe centerline. A hand-held vibrator, commonly used for concrete work, can be used for this purpose. The vibrator must be inserted every 3 ft. on each side of the pipe.

For sewer lines up to 24 in. in diameter initial backfill material must be placed in two lifts above the bedding material the pipe is set on.

The first lift must be spread uniformly and simultaneously on each side and under the bottom quadrant of the pipe to the midpoint or spring line of the pipe. Consolidate the Initial Backfill material as specified for bedding.

Placement of the first lift of initial backfill must be subject to inspection and approval before placement of second lift, which must extend from the spring line of the pipe to a minimum of 1 ft. above the top of the pipe. The second lift must be evenly spread in a similar manner as the first lift.

For diameters 24 in. and larger, initial backfill material must be evenly and simultaneously spread alongside, under the lower quadrant the pipe and over the pipe in 12 in. lifts to a minimum of 1 ft. above the top of the pipe. Consolidate the Initial Backfill material as specified for bedding.

The secondary backfill material must be placed in maximum 12 in. loose lifts or as directed.

### 3.5. Pipe Installation.

#### 3.5.1. General.

All sanitary sewer mains must be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, and details shown on the plans and as directed. Successful passage of the air test, as described under TCEQ 30 TAC 217.53 Criteria, must be required for the acceptance of the mains.

After the trench has been carefully graded and all bell holes excavated, approval is required before placing the pipe therein.

All sewers are to be laid in straight alignment, so that a light can be seen from one manhole to the other even for the smaller size of sewers. The pipe is to be laid accurately to line and grade, with the spigot end downstream entering the bell to full depth and in such a manner as not to drag earth into the annular space.

Pipes and fittings are to be fitted together and matched so that they will form a sewer with a smooth and uniform invert. Special care is to be taken to provide uniform bearing for the entire length of pipe.

Water Main Crossings: Where gravity or force main sewers are constructed in the vicinity of water mains, the requirements of the TCEQ 30 TAC 217.53 (d) must be met.

Maintain service to sewer lateral connections, whether connected to the existing or proposed sewer lines, at all times for the duration of the construction, unless directed otherwise by the Engineer.

#### 3.5.2. Pipe and Fittings.

Proper and suitable tools and appliances for the safe and convenient handling of the pipe and fittings are to be provided and used.

Care is to be taken to prevent any damage to the pipe coating. All pipe and fittings will be examined for defects right before placing into the trench and no materials are to be laid that are known to be defective.

Any defective pipe discovered after being laid is to be removed and replaced with acceptable pipe at the Contractor's expense. Wherever the pipe requires cutting, it is to be done with a standard wheel pipe cutter for pipe 12 in. and smaller. Cutting methods for larger pipes are to be as approved. Each cut is to be smooth and at right angles to the axis of the pipe.

Pipe Laying: The Contractor is required to commence construction and laying of pipe at the downstream end of the sanitary sewer outfall line and proceed non-stop in a forward upstream direction.

No pipe must be laid within 10 ft. of any point where excavation is in progress. Pipe laying must proceed upgrade with the tongue or spigot pointing in the direction of flow. Pipe must be lowered into the trench without disturbing the prepared foundation or the trench sides.

The drilling of lifting holes in the field will not be permitted. Pipe must be installed by means of a concentric pressure being applied to the pipe with a mechanical pipe puller. Pulling or pushing a joint of pipe in place by using a crane, bulldozer, or backhoe will not be permitted. Pipe must be pulled home in a straight line with all parts of the pipe on line and grade at all times. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation.

Should coupled joints of pipe be out of line or off grade, they must be removed one joint at a time and brought to the proper line and grade. The lifting or moving of several joints of coupled pipe at one time to close a partially open joint or to fine grade under laid joints of pipe will not be permitted.

Laser Beams: The use of laser Beams for vertical control must be required provided the Contractor makes available to the Inspector, when requested, a level and rod of enough sensitivity to accurately determine differences in elevation between points 300 ft. apart with one instrument set-up.

No pipe must be installed in tunnels except as provided on the plans, or with the permission of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided on the plans, he must submit to the Engineer, before commencement of work, a detailed outline of procedures, methods, and use of materials depending on existing soil conditions.

No horizontal or vertical curves will be permitted in conformance with appropriate regulatory agency requirements.

Before leaving the work unattended, the upper ends of all pipelines must be securely closed with a tight fitting plug or closure. The interior of laid pipe must be kept free from dirt, silt, gravel, or foreign material at all times. All pipes in place must be approved before backfilling.

When replacing an existing system in place, maintain screens to prevent the entrance of construction debris into the sewer system.

### 3.5.3. **Service Connections (Sanitary Sewer Laterals).**

3.5.3.1. Sanitary sewer laterals fittings and appurtenances must conform to the Sanitary Sewer specifications and must be installed by the Contractor as specified herein, or as directed and in accordance with the plans.

3.5.3.2. Service Line Installation: All service line installations must be performed in accordance with this specification. For sanitary sewer mains that are 12" in diameter or smaller, all laterals must be connected using the appropriate size tee or wye placed in line with the main line. For mains larger than 12," Inserta Tee conforming to ASTM 3034-88 or approved equal may be used.

3.5.3.3. Connection to the customers' end of the lateral must be performed using a coupling conforming to Section 2.9. All Cleanouts at jobsites must have installed an approved heavy duty sanitary sewer cap.

#### 3.5.3.4. **Service Connections.**

3.5.3.4.1. Provide reconnections of all existing sewer service laterals to new lines installed or provide connections of new laterals to existing sanitary sewer mains. Locate laterals and insure service is not interrupted to homes or other establishments.

3.5.3.4.2. Wyes, bends, tees, stacks, and other hardware required are to be installed for service laterals as shown on the plans or as directed.

### 3.5.4. **Coating and Wrapping Underground Steel Pipe.**

Exterior surfaces of all steel pipe fittings and specials which are to be installed underground and which are not to be encased in concrete will be cleaned to bare metal by wire brushing with a power driven wire brush, sand blasting, or other approved methods. A prime coat compatible to the polyvinyl tape to be used will then be applied to the pipe. Following the application of the prime coat, the pipe will be wrapped with Scotchrap, Trantex V-10 polyvinyl tape, or approved equal. The tape will not be applied until the prime coat is completely dry.

The tape will be spirally and tightly wrapped on each section of the pipe with a 50 percent lap. The joint will be protected with tape 8 in. in width on pipe greater than 12 in. in size.

Each section of pipe will be cleaned, primed, and wrapped to within 6 in. of each end. The priming and wrapping will be completed, and the bare pipe wrapped with tape lapped 3 in. over the originally taped sections.

3.6. **Manhole Construction.**

Manhole construction is to be in accordance with Item 465, "Manholes and Inlets," and as specified herein.

Access to manholes must be maintained throughout construction by raising or lowering manhole tops as necessary (not a separate pay item).

Footings or bases of manholes must be a minimum of 12 in. thick.

3.6.1. All invert channels of manholes are to be constructed and shaped accurately so as to be smooth, uniform and cause minimum resistance to flow. The bench is to be finished smooth with a minimum slope of 1 in. per foot. The top half of all sewer pipes within the invert channel or bench zone are to be removed flush to the inside manhole walls.

3.6.2. Joints on sewer pipes are not to be cast or constructed within the wall sections of manholes.

3.6.3. Where connections to existing manholes are required, the adjacent pipe bedding is to be prepared to proper grade, the existing manhole neatly cut and the new pipe inserted so that the end is projecting 2 in. from the inside wall. The invert is then to be reshaped to properly channel new flows. Debris of any kind is to be kept out of new or existing manholes or mains.

3.6.4. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes are to be filled with a non-shrink grout or concrete as approved or as shown on the plans and inspected before backfilling.

3.6.5. **Monolithically Poured Concrete Manholes.**

Wall thickness of the manhole is not to be less than 6 in. The structure is to be poured in a manner to produce dense, compacted walls free of honeycomb surfaces throughout the pour. The base is to be poured monolithically with the walls to the manhole.

3.6.5.1. Concrete: All concrete must conform to the provisions of "Concrete (Class A)," or must be of the class as noted on the plans.

3.6.5.2. Reinforcing Steel: All reinforcing steel must conform to provisions of "Reinforcing Steel," Item No. 440.

3.6.5.3. Base Diameter: The minimum base diameter must be 8 in. greater than the outside diameter of the manhole.

3.6.5.4. Cold Joints: A cold joint will be allowed should the manhole invert depth exceed 12 ft. One joint will be allowed per each 12 ft. of depth and that joint must be approved by the Engineer.

3.6.5.5. Backfill: No backfill must be placed around the manhole until 24 hr. after the pour has been completed. Flowable fill must be used from the base of the manhole to 1 ft. below the cone section or otherwise as authorized by the Engineer. Backfill for the cone section of the manhole must conform to the provisions of Section 2.12.4., "Secondary Backfill."

3.6.6. **Manhole Ring Encasement.**

All manhole rings are to be encased with non-reinforced Class S concrete. Manhole ring encasements are to extend 6 in. below the top of the cone and have a minimum thickness when measured at the manhole ring of 1 ft. The surface of the encasement is to be flush with roadways and 1-3 in. above grade elsewhere.

### 3.7. Jacking, Boring, or Tunneling Pipe.

#### 3.7.1. Jacking:

Suitable pits or trenches must be excavated for the purpose of jacking operations for placing end joints of the pipe. When trenches are cut in the side of embankment, such work must be securely sheeted and braced. Jacking operations must in no way interfere with the operation of railroads, streets, highways or other facilities and must not weaken or damage such facilities. Barricades and lights must be furnished as directed to safeguard traffic and pedestrians.

The pipe to be jacked must be set on guides to support the section of pipe being jacked and to direct it in the proper line and grade. Embankment material must be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the opening thus provided. The excavation for the underside of the pipe, for at least  $\frac{1}{3}$  of the circumference of the pipe, must conform to the contour and grade of the pipe. A clearance of not more than 2 in. may be provided for the upper half of the pipe.

The distance that the excavation must extend beyond the end of the pipe will depend on the character of the material, but it must not exceed 2 ft. in any case.

Generally, the pipe must be jacked from downstream end. Permissible lateral or vertical variation in the final position of the pipe from line and grade will be as shown on the plans or as determined by the Engineer.

Any pipe that cannot be repaired to its original condition or is damaged in jacking operations must be removed and replaced at the Contractor's expense. Jacking pits must be backfilled immediately upon completion of jacking operations.

Excavation for "Boring" pits and installation of shoring will be as outlined under Section 3.7.1., "Jacking." Boring operations may include a pilot hole which must be bored the entire length of crossing and must be used as a guide for the larger hole to be bored. Water or drilling fluid may be used to lubricate cuttings. Variation in line and grade must apply as specified under "Jacking."

#### 3.7.2. Tunneling:

Tunneling may be used when the size of the proposed pipe would make the use of tunneling more satisfactory than "Jacking" or "Boring." The excavation for pits and the installation of shoring must be as specified under "Jacking." The lining of the tunnel must be of the material shown on the plans. Access holes for grouting annular space must be spaced a maximum of 10 ft.

Joints: Joints for pipe for "Jacking," "Boring," or "Tunneling," must be as specified in "Sanitary Sewers," or as shown on the project plans or shop drawings as per pipe manufacturer's recommendation.

#### 3.7.3. Grouting of Bores or Tunnels:

Annular Space between casing pipe and limits of excavation (borehole) must be pressure grouted, unless otherwise specified on the plans.

### 3.8. Concrete Encasement, Cradles, Saddles and Collars.

#### 3.8.1. Concrete Encasement.

When concrete encasement is shown on the plans or when directed, the trench is to be excavated and fine graded to a depth conforming with the details and sections shown on the plans. The pipe is to be supported by pre-cast concrete blocks of the same strength as the concrete for encasement and securely tied down to prevent floatation. Encasement concrete is to be placed to a depth and width conforming with details and sections shown on the plans.

3.8.2. **Concrete Cradles.**

When concrete cradles are shown on the plans or when directed, the trench is to be prepared and the pipe supported in the same manner as described in Concrete Cradles, of this Section. The cradle constructed in accordance with details and sections shown on the plans. Strap and Tie Downs must be No. 4 rebar diameter minimum or better as determined by the Engineer.

3.8.3. **Concrete Saddles.**

When shown on the plans or when directed, pipe to receive concrete saddle is to be backfilled for a depth and width conforming with details and sections shown on the plans.

3.8.4. **Concrete Collars.**

When shown on the plans or when directed, concrete collars are to be constructed in accordance with details and sections shown on the plans.

3.9. **Adjust or Abandon Manholes.**

Existing manholes are to be adjusted or abandoned in accordance with Item 479, "Adjusting Manholes and Inlets," and as specified herein.

3.9.1. Manholes must be lowered below subgrade before placing base materials and openings must be protected by hatch covers.

Existing manhole rings and covers which are determined by the Engineer to be in an unacceptable condition, will be removed and replaced with new rings and cover. Take all necessary measures to prevent damage to existing or new rings, cover, or cone from equipment and materials used in or taken through the work area.

If an existing or new manhole cover, ring, or cone is damaged by the Contractor, it will be replaced by the Contractor at his expense. (The contractor must upgrade the cone and ring to meet 30 TAC 217.55 (2)(2)(a))

Manholes must be adjusted after the base material has been laid and before placing of the surface course. Manholes that are going to be adjusted on an existing surface course not being replaced will be in accordance to the City of Boerne Standard Specifications for Public Works Construction Detail Drawing 02530-2.2. All manholes must then be raised, or lowered enough height so as to be level with the finished surface course. Adjustment in height will be made by addition or removal of "throat rings" above the manhole "cone" where feasible. A minimum of two and a maximum of four throat rings must be used at each manhole (see section 2.2.4). Material excavation from around the manholes must be replaced with concrete in accordance with Standard Drawings, and select materials from the excavation (as shown on the plans or specified by the Engineer). All excess materials will be disposed of by the Contractor at his own expense and at an approved location.

3.9.2. Manholes existing on sewer lines replaced by new sewer piping and which are no longer needed for the revised sewer network are to be classified as "Abandon Manhole." Work required on an abandoned manhole is to consist of installing a permanent concrete plug on all pipes within the manhole, removing the top of the manhole to an elevation of 2 ft. below proposed subgrade or existing grade, whichever is the lower elevation, and backfilling the manhole with a grout material as specified. The ring and cover of the manholes are to be removed and delivered to Sanitary Sewer Owner's facility designated by the Engineer. If directed, drainage holes are to be drilled in the bottom of manhole walls before backfilling.

3.10. **Cut and Replace Pavement.**

Where sewers must be installed in streets or other paved areas that are going to remain, the work is required to be in accordance with Item 400, "Excavation and Backfill for Structures."

When allowed by the construction sequence shown on the plans or as directed, a "Temporary Concrete Cap" of the depth and class of concrete as shown on the plans, or as directed, may be used instead of a permanent repair.

As an alternate when shown by the plans, or as directed, pavement repair may be accomplished by a "Temporary Asphalt Cap" of the depth and class as shown on the plans instead of a permanent repair.

3.11. **Cut and Replace Concrete Sidewalks, Driveways, and Curbs.**

Existing concrete sidewalks, driveways, and curbs required to be removed and replaced solely for sewer installation are to be a part of sewer work. Removal is to be in accordance with Item 104, "Removing Concrete." Replacement is to be in accordance with the plans and with Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter," Item 530, "Intersections, Driveways and Turnouts," and Item 531, "Sidewalks."

As an alternate when shown by the plans, or as directed, concrete sidewalk repair may be accomplished by a temporary asphalt (4 in. depth, Type C) pavement instead of a permanent repair.

Any work done due to damage to curbs, sidewalks and driveways outside the limits shown on the plans or approved in advance will not be measured for payment but is to be replaced at the Contractor's expense.

3.12. **Removing and Replacing Chain-Link or Wire Fence.**

Existing chain link or wire fences required to be removed solely for sewer installation is to be replaced as part of the sewer work to a condition comparable to that at removal. The existing fence materials may be reused if they are not damaged during removal. Any removal or damage to existing fences outside the limits shown on the plans or not approved in advance will not be measured for payment but is to be restored at the Contractor's expense.

3.13. **Abandon Sewer Lines.**

When shown on the plans, existing sewer lines, including any washouts and voids, are to be abandoned by injecting the line with a flowable cement based grout of at least 100 psi. The grout mix design and method of installation are to be approved before beginning operation.

Abandonment of sanitary sewer lines must be accomplished by installing the grout material with enough pressure and in numerous locations. The method of installation must be able to meet the requirement of completely filling the existing sanitary sewer line and any voids adjacent to the sanitary sewer line. The method must adequately provide for the removal and legal disposal of existing sewer materials in the system. The method must provide for the release of air. When intermediate points are required to be constructed for the abandonment of the system, they must be a part of the abandonment project process.

Sanitary sewer pipes smaller than 15 in. in diameter are generally not required to be grouted, unless it is required by the plans. Pipes to be abandoned must be grouted only if required by the plans and payment as per these specifications is provided.

3.14. **Television Inspection.**

Immediately upon cleaning the sanitary sewers, all new sewer mains and services are to be televised and videotaped to determine the condition of the line and to locate service connections. The Engineer, Inspector and Contractor will observe the TV inspection in progress. The Contractor is to submit 1 copy of a color DVD of the recordings and logs of the televised inspection to the Engineer.

Floating the camera will not be allowed. There may be occasions during the televised inspection of a manhole section when the camera will be unable to pass an obstruction. At that time, and before proceeding, contact the Inspector. If the length of sewer line cannot be televised because of obstructions,

clean the system as is necessary. If, in the opinion of the Inspector, the obstruction is attributed to a collapsed main or pipe deflection, televising must be suspended, payment will be made based on the actual televised length, and the remaining televising of the sewer line will be continued upon successful correction of the blockage by the Contractor at his expense. No additional payment will be made for additional setups required due to obstructions encountered during televising.

The Contractor is solely responsible for any damage of sewer mains as a direct result of televising operations. Any repair is also the responsibility of the Contractor. The methods used for securing passage of the camera are at the discretion of the Contractor. No separate or additional payment will be made for any excavation, man entry, or any other method which may be required to retrieve video equipment that may have been hung up, destroyed, or lost during the operation.

#### 3.14.1. **Post-Construction Television Inspection.**

TV inspection is to be done 1 manhole (structure) section at a time the flow in the section being televised must be by-passed if the line is in service and the flow exceeds 25% of the internal pipe diameter. When the depth of flow at the upstream manhole of the manhole section being worked is above the maximum allowable for television inspection, the flow must be reduced to allowable levels by temporarily plugging or blocking the flow or by-pass pumping, as approved. Any debris detected during inspection will be removed and the inspection will be repeated. Any defects detected will be corrected and the main will be re-tested and re-inspected.

Pipe will be cleaned and flushed with water before video inspection. Service laterals will be inspected from cleanout wye to main. Video must demonstrate pipe is free from sags and defects in construction. If a sag is suspected, a sag test will be performed in the following manner: Provide a flow upstream of the suspected sag such that flow depth is equal to one half the diameter of a standard USPGA golf ball. Place a USPGA golf ball in front of the camera and push the ball into the suspected sag. If the golf ball is submerged, the sag is unacceptable and will be remedied before acceptance.

#### 3.14.2. **Obstructions and Hindrances.**

All sections of the new sewer main are to be televised. Contractor is to insure the main is clean and clear of obstructions before performing televising activities. Any abnormalities such as, but not limited to, misaligned joints, cracked or defected pipe, rolled gaskets, must be repaired by the contractor at his expense. Sections requiring repair will be re-televised to verify condition of repair. No additional payment is to be made for additional set-ups required or delays due to repairs or removal of obstructions.

#### 3.14.3. **By-Pass Pumping.**

Perform by-pass pumping operations in accordance with the Specifications. Furnish all labor, supervision, tools, equipment, appliances, and materials to perform all operations in connection with by-pass pumping of sewage flow for the purpose of preventing interference with the televising of the sanitary sewer manholes and mainlines as well as providing reliable sewer service to the occupants of the buildings being served.

The Contractor will be required to provide adequate pumping equipment and force mains to maintain reliable sanitary sewer service in all sanitary sewer lines involved in this project. Notify the Inspector should a surcharge occur during the televising process which results in overflows of sewage. In case of by-pass equipment failure, discontinue work and release sewer flows until equipment failure is corrected. The location of the pumps, force mains, and discharge points must be approved by the Engineer. Under no circumstances must the flow be interrupted or stopped, such that damage is done to either private or public property, or sewage flows or overflows into a storm sewer or natural waterway.

Provide by-pass pumping of sewage around each segment of pipe that is to be televised. The Contractor is responsible for all required bulkheads, pumps, equipment, piping, and other related appurtenances to accomplish the sequence of pumping. A qualified person must man the pumps, on-site, at all times during the by-passing procedure.

All piping, joints, and accessories must be designed to withstand the maximum by-pass system pressure, or a minimum of 50 psi, whichever is greater. During by-pass pumping, no sewage must be leaked, dumped, or spilled into or onto any area outside of the existing sanitary sewer system. When by-pass pumping operations are complete, all piping must be drained into the sanitary sewer before disassembly. Demonstrate that the pumping system is in good working order and can successfully handle flows during cleaning and televising operations, before commencing with the cleaning and televising of the system.

#### 3.14.4. **Video Equipment Operations.**

The Contractor is to be responsible for the TV inspection equipment with an accurate footage counter which displays on the monitor the distance of the camera from the centerline of the starting manhole.

The camera height is to be adjusted such that the camera lens is always centered (1/2 ID or higher) in the pipe being televised. In no case will the television camera be pulled or propelled through the line at a speed greater than 40 ft. per minute.

#### 3.14.5. **Post Repair TV Inspection.**

Upon completion of any repairs required by the Inspector, Engineer, the Contractor will re-televiser the sewer and submit these DVDs to the Inspector. These DVDs are to be permanently labeled as described in Section 2.10 and are to be used as a portion of the acceptance criteria. This post repair-TV inspection is to be done to the satisfaction of the Engineer, and is subject to the same acceptance criteria as the post construction-TV inspection DVDs. Post repair-TV inspection is to be provided at the Contractor's expense.

#### 3.14.6. **Negotiability of Sewers.**

The Engineer makes no guarantee that all of the sanitary sewer mains proposed to be TV inspected are clear for the passage of a camera.

No separate or additional payment will be made for any excavation, man entry or any other method, which may be required to retrieve video equipment that has been hung up, destroyed or lost during the televising operation.

#### 3.15. **By-Pass Pumping.**

Provide by-pass pumping of sewage and wet weather flows around each segments of pipe that is to be replaced. The Contractor will be required to provide in writing a sequence of by-pass pumping for review and approval by the Inspector. Refer to the construction plans for the construction phasing and diversion requirements. The Contractor will also provide the Inspector a sketch showing the location of by-pass pumping equipment for each line segments around which flows are being by-passed. The Contractor is responsible for all required bulkheads, pumping, equipment, piping, etc., to accomplish the sequence of pumping. Cease by-pass pumping operations and return flows to the new or existing sewer when directed by the Inspector. All pipings, joints, and accessories must be designed to withstand at least twice the maximum system pressure or a minimum of 50 psi whichever is greater. During by-pass pumping, no sewage must be leaked, dumped, or spilled in or unto, any area outside of the existing sanitary sewer system. When by-pass pumping operations are complete, all pumping must be drained into the sanitary sewer before disassembly.

#### 3.15.1. **Pump Condition.**

Demonstrate that the pumping system is in good working order and can successfully handle flows 24 hr. a day.

### 3.15.2.

#### **Pump Operation.**

Plug off and pump down the sewer manhole and line segment in the immediate work area and maintain the sanitary sewer system so that surcharging does not occur. Where work required the line to be locked beyond working hours, operate the by-pass pump and man the operation 24 hr. a day.

Complete the repair, replacement, rehabilitation as quickly as possible, satisfactorily meet all test, and repair all deficiencies as specified before discontinuing by-pass pumping operations and returning flow to the sewer manhole or line segment.

Notify the inspector should a surcharge occur during the rehabilitation process resulting in the overflow of sewage. If the Contractor is unable to regain control of the situation, the rehabilitation operation should be suspended or terminated until the overflows have been controlled. Any damage to the materials, equipment or adjacent properties due to such surcharge will be repaired at the Contractor's expense.

Ensure that no damage will be caused to private property as a result of by-pass pumping operations. Ingress and egress to adjacent properties must be maintained at all times. Ramps, steel plates or other methods must be employed by the Contractor to facilitate traffic over surface piping. High traffic commercial properties may require alternate methods.

In the event, that sewage accidentally drains into the storm drainage system or is spilled within the project, immediately stop overflow, notify the inspector, and take necessary action to clean up and disinfect the spillage using an HTH, or equal, chemical to the satisfactory of the Engineer. If sewage is spilled onto public or private property, wash down, clean up and disinfect the spillage to the satisfaction of the Engineer.

Locate by-pass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways and alleys. In cases where the suction and or discharge lines are required to be buried for vehicle and pedestrian traffic, cost for this work is incidental and includes complete restoration of any surface features disturbed. Force main piping may be laid inside of storm drainage pipes to avoid surface interference with vehicular or pedestrian traffic. Flows must not be allowed to spill from said force mains into said drainage pipes. The use of existing storm drain systems must be approved by the Engineer. Force mains laid in storm sewers must be pressure pipe and fittings.

The Contractor must not intentionally damage or remove portions of existing storm sewer system structures or sanitary sewer structures for the purpose of installing by-pass pumping system without specific approval from the Inspector. If a structure is damaged, it must be reconstructed or replaced to the satisfaction of the Engineer at the Contractor's expense.

The Department will not be responsible for any damage to the by-pass pumping system sustained by the Contractor directly or indirectly as a result of storm water runoff within streets, ditches or storm sewer systems. The Contractor is responsible for any and all damage that results directly or indirectly from the interference of storm water runoff to by-pass pumping equipment, piping and appurtenances. It is the intent of these specifications to require the Contractor to establish adequate by-pass pumping as required regardless of the flow conditions.

### 3.16.

#### **Plug Valves**

Plug valve installation must include; valve, reaction blocking when required conforming to plans, valve box, concrete collar, and valve box lid.

The valve box must be placed in such a manner to prevent shock or stress being transmitted to the valve. All valves located 6 ft. and deeper must include valve key extensions inside the valve box. The Contractor has the option to install fully adjustable valve box and valve key extension systems, on all valves located between 6 ft. and 13 ft. Adjustable valve box and valve key extension systems must be centered over the valve's

operating nut with the box cover flush with the finished pavement surface or located at another level as directed. Valve boxes must be provided with concrete collars as shown in plans. Collars around such valve boxes must be formed and finished off neatly and in a workmanlike manner. The entire valve except for the operating nut must be coated with an approved structural coating and wrapped with Polywrap.

### 3.16.1. Anchorage and Blocking.

Suitable reaction blocking or anchorage is to be provided at all dead ends, plugs, caps, tees, crosses, valves and bends as shown on the plans. All mechanical restraints are to be bidirectional. Anchor blocks are to be constructed solidly behind the fitting and symmetrical with the axis of resultant thrust except where this is not possible as in the case of gravity anchorage for vertical bends. Special ties and anchor fittings may be used in conjunction with blocking when shown on the plans or as directed.

Thrust blocking is to be a minimum of Class "A" (3,000 psi), concrete placed between solid ground and the fitting except as otherwise shown on the plans. The area of bearing in contact with solid ground is to be that shown on the plans or as directed.

In all cases, the design of thrust blocking must be of enough size to withstand a soil pressure of 3000 psf, unless specified otherwise in the job plans or specifications. The maximum soil pressure value that will be allowed for the design of thrust blocking must be 5000 psf. When soil pressure bearing values of 4000 psf or 5000 psf are recorded for design of thrust blocks, copies of soil tests made for determining the bearing value of the soil is question must be submitted to the Engineer for verification.

The blocking is to be placed so that pipe and fitting joints will be accessible. Pipe polywrap is to be placed between the pipe or fitting and the concrete.

The reaction block on the unused branch of a tee is to be poured separately from the block across the back of the tee. If they are poured simultaneously, a rigid partition is to be placed between the blocks.

---

## 4. TRAFFIC CONTROL

### 4.1. General.

- 4.1.1. Follow procedures for traffic control safety according to Item 502, "Barricades, Signs, and Traffic Handling."
- 4.1.2. All streets and traffic ways must be kept open for the passage of traffic and pedestrians during the construction period unless otherwise approved.
- 4.1.3. When required to cross, obstruct or temporarily close a street or traffic way, provide and maintain suitable bridges, detours or other approved temporary expedients for the accommodation of traffic. Closing must be for the shortest time practical, and passage must be restored immediately after completion of the work.
- 4.1.4. Give the required advance notice of proposed operations to the fire and police departments and area medical facilities.
- 4.1.5. Give notice to owners or tenants of private property who may be affected by proposed operations.
- 4.1.6. Provide signs, signals, barricades, lights, and all other equipment, service and personnel required to regulate and protect all traffic and warn of hazards as approved and directed. Remove temporary equipment and facilities when no longer required and restore the area to its original or specified condition.
- 4.1.7. Provide and operate traffic control required to direct and maintain an orderly flow of traffic in all areas under the Contractor's control or affected by the Contractor's operations.
- 4.1.8. Provide traffic control at the following locations:
  - at each change of direction of a roadway and at each crossroad,

- at detours and hazardous areas, and
- at parking areas.

#### 4.2. **Traffic Notes and Special Conditions.**

- 4.2.1. It is the Contractor's responsibility to insure that all traffic control devices are properly installed and maintained. All locations and distances will be determined in the field, by the Contractor, using the Texas Manual on Uniform Traffic Control Devices. If the traffic control devices do not conform to established standards, or are incorrectly placed or insufficient, the Engineer has the authority to stop construction operations until the conditions are corrected.
- 4.2.2. Notify the Engineer then contact the City Traffic and Signalization Departments one week in advance of any street closure.
- 4.2.3. As work progresses, adjust and modify the location for traffic control devices, as necessary or directed.
- 4.2.4. Additional traffic control devices, special directional devices, or business name signs (as requested by businesses) may be required at the Contractor's expense.
- 4.2.5. The Contractor will be responsible for suitable access accommodations for:
  - pedestrians, including school children,
  - delivery of mail by the U.S. Postal Service, and
  - residents and all businesses during all phases of work.
- 4.2.6. At no time will the Contractor have more than 50 ft. of trench unbackfilled or unconcreted, nor more than two open excavation areas at any one time, unless previously approved.
- 4.2.7. Provide for lane closings and traffic routing such that a minimum of two lanes on one-way streets and one lane each way on two-lane streets is maintained open to traffic at all times.

#### 4.3. **Parking Control.**

- 4.3.1. Contractor-related vehicular parking must not interfere with public traffic or parking, access by emergency vehicles, other utility operations, or construction operations.
- 4.3.2. Temporary parking facilities for the public will be provided by the Contractor as required due to construction operations.
- 4.3.3. Parking of all construction and private vehicles will be monitored by the Contractor.
- 4.3.4. Free vehicular access to and through parking areas will be maintained.
- 4.3.5. Parking will be prohibited in non-designated areas.

#### 4.4. **Haul Routes.**

Consult with governing authorities to establish haul routes and site access.

#### 4.5. **Traffic Control While By-Pass Pumping.**

Locate by-pass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways and alleys; to include the possible temporary trenching of force mains at critical intersections. Traffic control must be approved.

- 4.6. Payment for the above traffic control operations will not be paid for separately, but will be considered subsidiary to this Item.

---

## 5. TESTING.

### 5.1. Manhole Testing.

Successful passage of a vacuum test is required for acceptance of standard sanitary sewer manholes.

#### 5.1.1. Vacuum Testing:

5.1.1.1. General. Manholes must be tested after installation and before backfilling with all connections (existing or proposed) in place. Test manholes before grouting horizontal joints. Lift holes must be plugged with an approved non-shrink grout before testing. Drop-connections and gas sealing connections must be installed before testing.

5.1.1.2. Test Procedure. The lines entering the manhole must be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs must be installed in the lines beyond drop connections, gas sealing connections, etc. The test head must be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 in. of mercury must be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum must be read after the required test time. If the drop in the level is less than 1 in. of mercury (final vacuum greater than 9 in. of mercury), after two minutes with all valves closed the manhole will have passed the vacuum test.

5.1.1.3. Approval. Manholes will be approved in relation to vacuum test requirements if they meet the criteria above.

5.1.1.4. Any manhole which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material the manhole is constructed of. Manholes must be repaired on the exterior surface only before backfilling. The manhole must be retested as described above until a successful test is made. After a successful test, the temporary plugs will be removed.

5.1.1.5. Repairs to existing manholes. Any existing manhole which fails to pass the vacuum test must be closely examined by the Owner and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor will either repair or remove and replace the manhole as directed. The manhole must then be retested. The Owner may elect to simply remove and replace the existing manhole with a new manhole.

5.1.1.6. Measurement and Payment. Vacuum testing of new manholes will not be a pay item. The cost of this work will be included in the bid price for the new manhole.

### 5.2. Low Pressure Air Testing.

The Contractor will conduct low pressure air tests on completed sections of sewer main in accordance with ASTM F1417. The air test results will be used to evaluate materials and construction methods on the pipe line sections. Successful air tests will be mandatory for the acceptance of the lines. Copies of test results are to be made available to the Inspector upon request.

#### 5.2.1. Materials for Air Testing.

The Contractor is to furnish all materials and equipment for air testing including the Air Compressor.

#### 5.2.2. Test Procedures.

The procedure for the low pressure air test must conform to the procedures described in ASTM C-828, ASTM C-924, ASTM F-1417 or other appropriate procedures, except for testing times. The test times will be as outlined in this section. For sections of pipe less than 36 in. average inside diameter, the following procedure will apply unless the pipe is to be joint tested. The pipe must be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 lbs. per sq. in. gauge to 2.5 lbs. per sq. in. gauge must be computed from the following equation:

$$T = (0.085xDxK) \backslash Q$$

T = Time for pressure to drop 1.0 lb. per sq. in. gauge in seconds

K = 0.000419xDxL, but not less than 1.0

D = Average inside pipe diameter in in.

L = Length of line of same pipe size being tested, in ft.

Q = Rate of loss, 0.0015 cu. ft. per min. per sq. ft. internal surface must be used since a K value of less than 1.0 must not be used.

There are minimum testing times for each pipe diameter as follows

Table 1

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
Inches	Seconds/Ft	Feet	Seconds/Ft
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309
30	1,700	80	21.369
33	1,870	72	25.856

Note: Test time starts after the required 60 seconds of stabilization time.

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test must continue for the entire test duration as outlined above or until failure. Lines with a 27 in. average inside diameter and larger may be air tested at each joint. Pipe greater than 36 in. diameter must be tested for leakage at each joint. If the joint test is used, a visual inspection of the joint must be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 lbs. per sq. in. gauge to 2.5 lbs. per sq. in. gauge must be 10 seconds.

### 5.3.

#### Deflection Testing.

Deflection test must be performed on all flexible pipes.

For pipelines with inside diameters less than 27 in., a rigid mandrel must be used to measure deflection. For pipelines with an inside diameter 27 in. and greater, a method approved by the Engineer or Inspector must be used to test for vertical deflections. Other methods must provide a precision of  $\pm 0.2\%$  deflection. The test must be conducted after the final backfill has been in place at least 30 days. No pipe must exceed a deflection of five percent. If a pipe should fail to pass the deflection test, the problem must be corrected and a second test must be conducted after the final backfill has been in place an additional 30 days.

The tests must be performed without mechanical pulling devices. The design engineer should recognize that this is a maximum deflection criterion for all pipes and a deflection test less than 5% may be more appropriate for specific types and sizes of pipe.

5.3.1. **Mandrel Sizing.**

The rigid mandrel must have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe.

5.3.2. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, must be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, all dimensions must be per appropriate standard. Statistical or other "tolerance packages" must not be considered in mandrel sizing.

5.3.3. **Mandrel Design:**

The rigid mandrel must be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel must have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel must have a length of at least 75% of the inside diameter of the pipe. A proving ring must be provided and used for each size mandrel in use.

5.3.4. **Method Options:**

Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. A deflectometer may be approved for use on a case by case basis. Mandrels with removable legs or runners may be accepted on a case by case basis.

5.4. **T.V. Camera Testing.**

After the vacuum tests on the manholes and the air tests on the sewer lines are performed by the Contractor, City of Boerne may perform a T.V. Camera Test with their forces and equipment on the completed sewer lines. The T.V. test will be observed by the Department and Contractor personnel as the camera is run through the sewer lines.

Any sections in the sewer lines found by the camera such as broken pipe, misaligned pipe joints (that could result in a leak), etc. as determined to be damaged or abnormal are to be repaired or replaced by the Contractor at his expense.

---

6. **MEASUREMENT.**

6.1. **Sewer Excavation and Non-stabilized Backfill.**

Sewer excavation and non-stabilized backfill will be measured in accordance with Item 400, "Excavation and Backfill for Structures" but will not be measured for payment and will be considered subsidiary to the sewer line installation.

6.2. **Trench Excavation Protection.**

Trench excavation protection will be measured by the linear foot along the centerline of the trench where the depth exceeds 5 ft.

6.3. **Sanitary Sewers.**

Longitudinal measurement of sanitary sewers will be made along the centerline of the sewer from center of manhole to center of manhole or end of main by the foot of the various sizes and types (when a specific type is required) of sewers shown on the plans, in accordance with this specification, complete and accepted.

Plugging existing sewer lines will be considered subsidiary to the pipe installation.

6.4. **Sanitary Sewer Cleanouts.**

One way cleanouts are to be installed on all laterals at the customer's property line and will be measured for payment by each installed.

6.5. **Sanitary Sewer Laterals.**

The lengths of laterals will be measured from the centerline of the sewer main to the connection at or within the customer's property line or premises. Wyes, tees, and bends of any kind will not be paid for separately for laterals but will be measured for payment by the linear foot of lateral to be installed.

6.6. **Jacking, Boring or Tunneling.**

Jacking, Boring or Tunneling will be measured by the linear foot of bore or tunnel as measured from face to face of jacking pits.

6.7. **Carrier Pipe.**

Carrier pipe used in bores and tunnels or backed into place will be measured by the linear foot of pipe installed from end to end of pipe to the limits shown on the plans.

6.8. **Casing or Liners.**

Casing or liners for open cut, split casing, bores and tunneling, where required on the plans, of the size and material required will be measured by the linear foot actually installed in accordance with the plans.

6.9. **Vertical Stacks.**

Vertical Stacks will be measured by the feet. Footage will be measured from the finish grade elevation (centerline) minus invert elevation minus 7 ft.

6.10. **Manhole Structures.**

Manholes structures will be measured by each manhole structure complete in place. Manhole structures will be installed where any pipe intercepted is larger than 24 in. in diameter. Rings and Watertight Covers, concrete ring encasement and I&I Barriers, will not be measured for payment, but will be considered subsidiary to the manhole.

6.11. **Pre-Cast Manholes.**

Manholes to 6 ft. deep and designated on plan will be measured by each type manhole complete in place including those exceeding 6 ft. in depth from the lowest invert elevation to the top of the ring. Rings and Watertight Covers, concrete ring encasement and I&I Barriers, and coating will not be measured for payment, but will be considered subsidiary to the manhole.

**6.12. Pre-Cast Manhole Extra Depth.**

Depth of pre-cast manholes deeper than 6 ft. will be measured by the number of feet in excess of 6 ft.

**6.13. Adjusted or Abandoned Manholes.**

Manholes adjusted or abandoned as prescribed herein, will be measured by each manhole. The excavation and backfill required and the I&I Barrier for Adjust Manholes will not be measured for payment, but will be considered subsidiary to this Item.

**6.14. Flowable Backfill.**

Flowable Backfill will be measured by the cubic yard in accordance with Item 401, "Flowable Backfill," but not to exceed the minimum trench width specified in Section 3.3.1, "Width of Trench" or as shown on the plans.

**6.15. Select Bedding Material.**

Select Bedding Material is always required; therefore, it will not be measured for payment.

**6.16. Concrete Encasement, Cradles, Saddles and Collars.**

Concrete encasement, cradles, saddles and collars for pipe will be measured by the cubic yard as dimensioned on the plans or as directed, complete in place. Reinforcing if required will not be measured.

**6.17. Concrete Curb, Sidewalks, and Driveways.**

For concrete curbs, sidewalks, and driveways required to be removed and replaced due to placement of sewer lines, removal of the existing concrete and pavement replacement will be measured by the linear foot or by the square yard as dimensioned and detailed on the plans, but not to exceed the minimum trench width specified in Section 3.3.1, "Width of Trench."

**6.18. Cut and Replace Pavement.**

The work to be done in the cutting and replacement of pavement will be measured by the square yard in accordance with the dimensions and details shown on the plans but not to exceed the minimum trench width specified in Section 3.3.1, "Width of Trench."

**6.19. Removing and Replacing Chain-Link or Wire Fence.**

This work will be measured by the linear foot of fence removed and replaced, regardless of the type or height of the fence, complete in place. The existing fence materials may be reused unless, the existing materials were damaged during removal and should not be reused, the Contractor is to provide new material for the replacement work at his expense.

**6.20. Abandon (Remove) Sewer Lines.**

When shown on the plans, this work will be measured by linear foot complete in place. No abandoned facilities will be allowed to remain in TxDOT ROW. Removed improvements must be sanitized in accordance with TCEQ guidelines before disposal.

**6.21. Television Inspection.**

This Item will be measured by the linear foot of main televised for TV inspection according to the size ranges specified on the plans. The linear foot measurement will be determined as the distance from the center of sewer manhole to the center of sewer manhole.

6.22. **Hydrostatic Pressure Test.**

Hydrostatic testing of manholes will not be measured for payment.

6.23. **By-pass Pumping.**

This Item will be measured by the "Lump Sum" as the work progresses. No additional measurement or payment will be made for conditions caused by the Contractor during construction.

6.24. **Point Repairs and Obstruction Removal**

This item will be measured by the each as determined by the Inspector.

6.25. **Plug Valves**

This item will be measured as each assembly of the various sizes installed to finished grade.

**7. PAYMENT.**7.1. **Sewer Excavation.**

Payment for sewer excavation and non-stabilized backfilling in accordance with these specifications will not be paid for directly but will be included in the unit price bid for the sanitary sewer pipe installation. Select bedding and stabilized backfill will be paid for under their own items of work.

7.2. **Trench Excavation Protection**

Payment will be made at the unit price bid for "Sanitary Sewer (Trench Excavation Protection)" in place. Payment will include all components of the trench protection system which can include but not be limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate and acceptable drainage, any additional excavation or backfill required, jacking, jack removal, removal of the trench support after completion and all other labor, materials, tools, equipment and incidentals necessary to complete the work.

7.3. **Sanitary Sewers.**

Payment will be made at the unit price bid for "San Swr" of the size, and type (when a specific type is required) specified on the plans per linear foot complete in place.

7.4. **Sanitary Sewer Laterals.**

Payment will be made at the unit price bid for "Sanitary Sewer (Lateral Pipe)" of the size and type (when a specific type is required) specified on the plans per linear foot complete in place.

7.5. **Jacking, Boring or Tunneling.**

Jacking, Boring, or Tunneling will be paid for at the unit bid for "San Swr Jk Bor Tun Pipe" at the contract unit price bid per linear foot of jacking, which price will be full compensation for furnishing all materials (except carrier pipe, casings or liners), labor, tools, equipment, and incidentals necessary to complete the work, including excavation, grouting, backfilling, safety fencing, restoration to original ground conditions, and disposal of surplus materials.

7.6. **Carrier Pipe.**

Carrier pipe of the size and type specified on the plans will be paid for at the contract unit price bid for "San Swr Carrier Pipe" per linear foot of pipe installed and measured as prescribed above, complete in place.

7.7. Casings or liners of the size, type and installation method specified on the plans will be paid for at the contract unit price bid for "Casing or Liner" per linear foot of casing or liner installed and measured as prescribed above, complete in place.

7.8. **Vertical Stacks.**

Payment will be made at the unit price bid per linear foot, complete in place.

7.9. **Sanitary Sewer Cleanouts.**

Payment will be made at the unit bid price for "Sanitary Sewer (Cleanout)" of the size and type (when a specific type is required) specified on the plans, complete in place.

7.10. **Manhole Structures.**

Payment for Manhole structures, including the stack, rings, watertight covers, steps and concrete ring encasement, I&I Barriers, will be made at the unit price bid for "San Swr Manhole Structure (Complete)" of the type specified.

7.11. **Pre-Cast Manholes.**

Payment for Pre-Cast manholes, including the stack, rings, watertight covers, steps and concrete ring encasement, I&I Barriers, and manhole coating will be made at the unit price bid for "San Swr Pre-Cast Manhole (Complete)" of the type specified.

7.12. **Pre-Cast Manholes Extra Depth.**

Payment for extra depth manholes will be made at the unit price bid per linear foot as measured, for "San Swr Pre-Cast Manhole (Extra Depth)."

7.13. **Abandon or Adjust Manholes.**

Manholes abandoned or adjusted will be paid for at the unit price bid for "Sanitary Sewer (Abandon Manhole)" or "Sanitary Sewer (Adjust Manhole)."

7.14. **Flowable Backfill.**

Payment for "Flowable Backfill" will be made at the unit price bid for "San Swr Flowable Fill," but not to exceed the minimum trench width specified in Section 3.3.1. "Width of Trench."

7.15. **Select Bedding Material.**

Payment for "Select Bedding Material" will not be paid for directly but will be subsidiary to the pipe.

7.16. **Concrete Encasement, Cradles, Saddles and Collars.**

Payment will be made at the unit price bid for "Sanitary Sewer (Concrete Encasement, Concrete Cradles, Concrete Saddles and Concrete Collars)."

7.17. **Concrete Curbs, Driveways, and Sidewalks.**

Payment for replacement of curbs, driveways, and sidewalks will be made at the unit price bid for "Sanitary Sewer (Cut and Replace Concrete Sidewalk)," "Sanitary Sewer (Cut and Replace Concrete

Sidewalk)(Asphalt)," "Sanitary Sewer (Cut and Replace Concrete Driveway),"and "Sanitary Sewer (Concrete Curb)."

7.18. **Cut and Replace Pavement.**

Payment will be made at the unit price bid for "Sanitary Sewer (Cut and Replace Pavement)" of the type and replacement material shown on the plans.

7.19. **Remove and Replace Chain-Link or Wire Fence.**

Payment will be made at the unit price bid for "Sanitary Sewer (Remove and Replace Fence)."

7.20. **Abandon (Remove) Sewer Lines.**

Payment will be made at the unit price bid for "Abandon (Remove) Sewer Lines" of the size shown on the plans.

7.21. **Television Inspection.**

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "San Swr Post Television Insp" of the various size ranges specified on the plans. This price will include all labor, materials, equipment, tools, logging, and all incidentals necessary to complete the work.

7.22. **Hydrostatic Pressure Test.**

No direct payment will be made for hydrostatic testing manholes.

7.23. **By-Pass Pumping.**

The work performed and material furnished in accordance with this Item and measured as provided under "Measurement" will be paid for the unit price bid for "San Swr ByPass Pumping. Partial payments of this "Lump Sum" bid will be as follows:

7.23.1. When initial set-up and operation of the by-pass system begins, 40% of the line item will be paid.

7.23.2. The remaining portion of the line item will be paid when the by-pass pumping operations for the entire job are completed.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the various unit prices. These prices are full compensation for furnishing materials and for equipment, labor, tools, and incidentals.

7.24. **Point Repairs and Obstruction Removal**

The work performed with this item and measured will be paid for the unit price bid for "San Swr Pt Repairs and Obstruct Remov." The price will include the following:

7.24.1. Unit Prices - Point Repair:

Measurement for sewer line point repair is on a unit price basis for each repair performed. Minimum length of pipe to be replaced for each repair, determined by depth of sewer line measured from natural ground to flow line at point of repair.

9 ft. minimum length.

Measurement for sewer line extra length point repair is on a linear foot basis in excess of minimum replacement length specified above.

Payment for service lateral point repair is on a linear foot basis for all sizes of service laterals and for all depths (same unit price per linear foot, regardless of size and depth). No separate payment will be made for point repair done within the limits of a service lateral reconnection as defined in this Section. Minimum length of service lateral point repair is 3 ft.

Measurement for hand excavation: When authorized by the Inspector in locations where excavation by machine is not suitable, no direct payment will be made for hand excavation.

Measurement for abandonment of point repair by excavation: No direct payment will be made for abandonment of point repair.

Measurement for abandonment of point repair by video inspection: No direct payment will be made for abandonment of point repair by video inspection.

The cost of the following items of work are included in the unit prices for point repairs, and all associated work:

- (1) Excavation, embedment and backfill;
- (2) Hauling away and lawful disposal of excess excavated materials and debris;
- (3) Pipe, pipe fittings, adapters and concrete collars;
- (4) Smoke testing and any required retesting;
- (5) Restoration of site improvements, including sodding;
- (6) Post-cleaning video inspection;
- (7) All other necessary work to complete.

#### 7.24.2.

Unit Price - Obstruction Removal:

Obstruction removal by excavation will be paid per each obstruction removal performed. Obstruction removal can be submitted for payment when the obstruction has been cleared from the sewer line to be lined. Liner work must proceed at least 6 ft. before payment for removal of another obstruction will be considered (i.e., all obstruction within a distance of 6 ft. is considered to be part of the same obstruction.)

Obstruction removal by remote device will be paid on a unit price basis, per manhole section, and will include all obstruction removals within a manhole section.

The cost of the following work items are included in the unit prices for obstruction removal by remote device or excavation:

- (1) Cleaning of sanitary sewers due to broken pipe, roots, dirt, loose deposits, etc.;
- (2) Post television inspection;
- (3) Excavation, embedment and backfill;
- (4) Hauling away and lawful disposal of excess excavated material and debris;
- (5) Restoration of site improvements, including sodding;

(6) All other necessary effort to complete work.

Payment will not be made for obstruction removal if the existing sewer line, service line or tap is damaged and a point repair is required. Payment will not be made for removal of a protruding tap if the service reconnection is performed by excavation.

Removal of hard deposits, concrete, debris, pipes or any other material in a manhole, or that is accessible from the manhole wall, will be cleared under work items for rehabilitation of sanitary sewer pipes and manholes.

7.25.

**Plug Valves.**

Payment for "Plug Valve and Box (Complete)" will be made at the unit price bid for each such assembly of the various sizes installed. This payment is also to include selected embedment material, anti-corrosion embedment when specified, concrete collar at the valve box, ductile iron riser pipe, cast-iron boot, packing, tarpaper, concrete grout, concrete reaction blocking, asphaltic material for bolts, nuts and ferrous surfaces, polyethylene sleeve, hauling and disposition of excavated surplus material and backfill where required.