TECHNICAL SPECIFICATIONS

FOR

UTILITIES CONSTRUCTION

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SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-01-30
SEWER MAIN CLEANING

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 - Submittals
Section 33-01-31 - Sewer Main TV Inspection
Section 33-31-00 - Sanitary Sewers

B. SCOPE:

This item shall govern for the cleaning of sanitary sewer lines. Prior to commencing operations for the television inspection, slip lining, or other related activities such as grouting or internal sewer line rehabilitation, it shall become the responsibility of the CONTRACTOR to clean the line of any protrusions, solids, or any other extraneous materials, that might prevent the pulling of the television camera, liner pipe or other related equipment through the existing sewers.

PART 2 EXECUTION

2.1 GENERAL

A. The designated sanitary sewer manhole sections and manholes shall be cleaned using hydraulically propelled or high velocity sewer cleaning equipment. Selection of the equipment shall be based on the condition of the lines at the time the work commences. The equipment and methods selected shall be approved by the OWNER.

B. Satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Any damages done to a sewer main and/or structure by the CONTRACTOR shall be repaired by the CONTRACTOR at no additional cost and to the satisfaction of the OWNER. Cleaning shall also include the manhole wall washing by high pressure water jet.

C. All sludge, dirt, sand, rocks, grease and other solid or semi-solid material resulting from the cleaning operation shall be removed at the downstream manhole of the line section being cleaned. Passing of debris from manhole line section to manhole line section shall not be allowed.

D. All debris from manholes shall also be removed either manually or mechanically prior to the commencement of other related activities connected with the work. When hydraulic cleaning equipment is used, a suitable sand trap, weir or dam shall be constructed in the downstream manhole in such a manner that the solids shall be trapped. All solids or semi solids resulting from the cleaning operations shall be removed from the site and disposed of. It is the responsibility of the CONTRACTOR to secure a legal dump site for the disposal of this material. Under no circumstances shall sewage or solids be removed during the course of these operations be dumped into streets or into ditches, catch basins, storm drains, sanitary sewer manholes, rivers, or streams.

E. The OWNER makes no guarantee that all of the sanitary sewers to be entered are clear for the passage of cleaning equipment. The methods used for securing passage of the cleaning equipment are to be at the option of the CONTRACTOR and subject to the approval of the OWNER. The cost of retrieving the cleaning equipment and related apparatus, should it become lodged, by any means, during the cleaning process, shall be the responsibility of the CONTRACTOR.

F. If the CONTRACTOR removes or damages any portion of an existing manhole to get equipment into or out of the line, they must replace that portion of the manhole to existing or better condition as directed by the OWNER.

2.2 HYDRAUILIC CLEANING:

A. Hydraulic-propelled devices which require a head of water to operate must utilize a collapsible dam. The dam must be easily collapsible to prevent damage to the sewer main, property, etc.

B. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer lines are used, precautions shall be taken to ensure that the water pressure does not cause any damage or flooding to public or private property being served by the manhole line section involved.

C. The flow of sewage present in the sewer lines shall be utilized to provide the necessary fluid for hydraulic cleaning devices whenever possible. When an additional quantity of water from fire hydrants is necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed or used when there is a fire in the area. Before using any water from the public water supply system, the CONTRACTOR shall apply for and receive permission from the managing water utility. He shall be responsible for the water meter and related charges for the set up including the water usage bill. All expenses shall be considered incidental to cleaning.

2.3 HIGH VELOCITY CLEANING:

A. Cleaning equipment that uses a high velocity water jet for removing debris shall be capable of producing a minimum volume of 50 gpm, with a pressure of 1,500 psi, for the sanitary sewer line and 3,500 psi for the (manhole) structure at the pump. Any variations to this pumping rate must be approved, in advance, by the OWNER.

B. To prevent damage to older sewer mains and property, a pressure less than 1,500 psi can be used.

C. A working pressure gauge shall be used on the discharge of all high-pressure water pumps.

D. The CONTRACTOR shall use, in addition to conventional nozzles, a nozzle which directs the cleaning force to the bottom of the pipe for sewers 18" and larger in diameter.

E. The CONTRACTOR shall operate the equipment so that the pressurized nozzle continues to move at all times. The pressurized nozzle shall be turned off or reduced anytime the hose is on hold or delayed in order to prevent damage to the line.

2.4 MECHANICAL CLEANING:

A. Mechanical cleaning, in addition to normal cleaning when required, shall be with approved equipment and accessories driven by power winching devices. The CONTRACTOR shall submit the equipment manufacturer's operational manual and guidelines to the OWNER, which shall be followed strictly unless modified by the OWNER.

B. All equipment and devices shall be operated by experienced operators so that they do not damage the pipe in the process of cleaning.

C. Buckets, scrapers, scooters, porcupines, kites, heavy duty brushes, and other debris-removing equipment/accessories shall be used as appropriate and necessary in the field, in conjunction with the approved power machines. The use of cleaning devices such as rods, metal pigs, porcupines, root saws, snakes, scooters, sewer balls, kites, and other approved equipment, in conjunction with hand winching device, and/or gas, electric rod propelled devices, shall be considered normal cleaning equipment.

2.5 INSPECTION:

A. Inspection of the line cleanliness will be by the television inspection in the next phase of work.
B. CONTRACTOR to notify OWNER 48 hours prior to conducting work, to ensure an OWNER's representative is on site.

PART 3 PRODUCTS

See San Antonio River Authority approved products and materials list.

PART 4 MEASUREMENT AND PAYMENT

No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section. The costs for all such items required shall be considered subsidiary to other items of this Contract and shall not be paid for separately.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-01-31
SEWER MAIN TELEVISION INSPECTION

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 33-01-30 – Sewer Main Cleaning
Section 33-31-00 – Sanitary Sewers

B. SCOPE:

This item shall govern for the closed-circuit televising (CCTV) and recording of new line sections. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals to provide the televising and a NASSCO-(PACP) standard video and database, recorded in MPEG-1 format, of sewer lines and manholes utilizing a color, closed-circuit television inspection unit to determine their condition.

C. SUBMITTALS:

Prior to the television inspections the CONTRACTOR shall provide the following:

- CONTRACTOR is to coordinate the video procedures with the OWNER's inspector prior to commencement of any work, including mobilization and preparation of right-of way effort.

- The CONTRACTOR is to provide the televising and a NASSCO-(PACP) compliant database, and a NASSCO-(PACP) standard video, recorded in MPEG-1 format. All inspections shall be in accordance with NASSCO PACP requirements and a NASSCO PACP database.

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

- CONTRACTOR shall provide traffic control plan and bypass pumping plan, if required.

- Each submittal shall be permanently labeled with the following:

    1. Project name / RIVER AUTHORITY Job #;
    2. Date of television inspection;
    3. Station to station location and size of sanitary sewer;
    4. Street/easement location;
    5. Name of CONTRACTOR;
    6. Date DVD or flash drive submitted; and DVD/flash drive number.

PART 2 EXECUTION

2.1 GENERAL:

A. The CONTRACTOR shall inspect with closed circuit television equipment, the alignment, condition, location of existing service connections, any manhole line section suspected of having infiltration or other defects, or other purpose as requested by the OWNER. An inspection satisfactory to the OWNER shall be mandatory prior to the acceptance of the line.

B. The interior of the line sections of pipes eight inches (8") and above shall be carefully inspected after the line has been properly backfilled and successfully air tested to determine the location and extent of any breaks, obstacles, sags, irregularities in pipe alignment or grade, infiltration or inflow, the location of service connections, or any deficiencies that may degrade the line. The OWNER will make the final determination if repairs are required. If repairs are required, the repair must be made and the restored section shall be subsequently television inspected to verify correction of the deficiencies. The cost of all repairs shall be the responsibility of the CONTRACTOR.

C. Sewer lines shall be cleaned from manhole to manhole immediately prior to television inspection.

D. CONTRACTOR shall add clear water to new pipe section so that deficiencies, such as sags and slope issues, can be identified and repaired.

E. In the event that sewage accidentally drains into the drainage system or is spilled within the project, the CONTRACTOR shall immediately stop the overflow, notify the OWNER, and take the necessary action to clean up and disinfect the spillage using an HTH, or equal, chemical, at no additional cost to the OWNER.

F. CONTRACTOR shall be responsible for all traffic control and field safety, as necessary, to complete the project.

2.2 TELEVISING METHODS:

A. The CONTRACTOR shall provide logs of the televised inspection for review. If the CONTRACTOR provides a submittal that cannot be properly evaluated by the OWNER, the CONTRACTOR shall re-televise as necessary and provide a re-submittal of acceptable quality at no additional cost to the OWNER. If the CONTRACTOR cannot provide a re-submittal of such good quality that can be reviewed, the OWNER may elect to televise the line at the CONTRACTOR'S expense.

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

C. The television inspection equipment shall 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 shall be centered in the conduit being televised. The speed of the camera through the pipe shall not exceed 40 feet per minute.

D. Television inspection shall be done one manhole section at a time. The flow in the section being televised shall be bypassed 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 shall be reduced to allowable levels by temporarily plugging or blocking the flow or bypass pumping, as approved by the OWNER.

E. The CONTRACTOR shall not be allowed to float the camera. 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 prior to proceeding, the CONTRACTOR shall notify the OWNER. If the length of sewer line cannot be televised because of obstructions, the CONTRACTOR shall clean the system as is necessary. If the OWNER determines the obstruction is attributed to a collapsed main or pipe deflection, televising shall be suspended, payment shall be made based on the actual televised length, and the remaining televising of the sewer line shall be continued upon successful correction of the blockage by the CONTRACTOR at his expense. No additional payment shall be made for additional setups required due to obstructions encountered during televising.

F. The CONTRACTOR is solely responsible for any damage of sewer mains as a direct result of televising operations. Any repair shall also be the responsibility of the CONTRACTOR. The method(s) used for securing passage of the camera are at the discretion of the CONTRACTOR, as approved by the OWNER. No separate and/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, and/or lost during the operation. All repairs must be approved by the OWNER prior to being conducted.

2.3 SEWER MAIN BYPASS PUMPING:

A. The CONTRACTOR shall furnish all labor, supervision, tools, equipment, appliances, and materials to perform all operations in connection with bypass 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.

B. The CONTRACTOR will be required to provide adequate pumping equipment and piping in order to maintain reliable sanitary sewer service in all sanitary sewer lines involved in this project. The CONTRACTOR shall notify the OWNER should a surcharge occur during the televising process which results in overflows of sewage. In case of bypass equipment failure, the CONTRACTOR shall discontinue work and release sewer flows until such time as equipment failure is corrected. The location of the pump(s), force main(s), and discharge points shall be approved by the OWNER. Under no circumstances shall 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.

C. The CONTRACTOR shall provide bypass pumping of sewage around each segment(s) of pipe that is to be televised and shall be responsible for all required bulkheads, pumps, equipment, piping, and other related appurtenances to accomplish the sequence of pumping. A qualified person shall man the pumps, on-site, at all times during the bypassing procedure.

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

E. The CONTRACTOR shall be required to have all materials, equipment, and labor necessary to complete the repair or replacement on the jobsite prior to isolating the sewer manhole or line segment and beginning bypass pumping operations.

F. The CONTRACTOR shall coordinate with all property owners to ensure that no damage will be caused to their property during any and all sewer rehabilitation work. The CONTRACTOR shall complete the televising as quickly as possible and shall satisfactorily meet all requirements prior to discontinuing bypass pumping operations and returning flow to the sewer manhole or line segment.

2.4 TRAFFIC CONSIDERATIONS:

A. The CONTRACTOR shall locate bypass 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.

B. Traffic management shall be done under the approval of respective City, County, or State Traffic Departments. Proof of CONTRACTOR approval shall be provided to OWNER.

C. The CONTRACTOR shall not open cut existing streets to accommodate bypass pumping piping unless specific written approval by OWNER is provided.

D. Ramps, steel plates, or other methods shall be employed by the CONTRACTOR to facilitate traffic over surface piping. All items or methods used shall be traffic rated. There will be no separate pay item for this work.

PART 3 PRODUCTS

See San Antonio River Authority approved products and materials list.

PART 4 MEASUREMENT AND PAYMENT

No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section. The costs for all such items required shall be considered subsidiary to other items of this Contract and shall not be paid for separately.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-05
SEWER EXACAVATION, TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE

Section 01-33-00 – Submittals
Section 33-01-31 - Sewer Main TV Inspection
Section 33-05-06 - Sanitary Sewer Testing
Section 33-05-07 - Jacking, Boring or Tunneling Pipe
Section 33-05-61 - Standard Sanitary Sewer Manholes
Section 33-05-63 - Sanitary Sewer Structures
Section 33-31-00 - Sanitary Sewers
SAWS ITEM NO. 299 Flowable Fill
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 550 Trench Excavation Safety Protection

B. SCOPE

This section shall govern the excavation, trenching and backfilling for sanitary sewers and pipe culverts, unless otherwise noted in the project plans and specifications. The work shall include all necessary pumping or bailing, sheeting, drainage, the construction and removal of any required cofferdams, and any incidental construction.

Unless otherwise shown on the plans, bid proposal or contract documents, all excavation shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed, to include, but not limited to, rock, stone, sand, organic material, or whatever material is encountered.

C. OTHER JURISDICTIONS

All work within the railroad, local, county or state right of way must meet the indicated requirements in this section or the requirements indicated in the plans or permit, whichever is more stringent. Prior to the start of construction, the CONTRACTOR will be responsible for contacting the appropriate jurisdiction and coordinating his activities in accordance with the appropriate operating procedures. Approval for all completed work in other rights of way must be obtained from the appropriate official prior to acceptance.

D. SUBMITTALS

Submittals shall be as specified in *Section 01-33-00 – Submittals.*

Prior to the start of construction, the CONTRACTOR shall submit to the OWNER test results utilizing the provided tests. However, actual types of tests performed will be performed as specified on the project plans or contract documents:

- Plasticity Index: *ASTM D4318* (Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils),

- Gradation: *ASTM D6913* (Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis),
- Laboratory Compaction: *ASTM D698* (Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort),
- *ASTM D558* (Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures),
- *ASTM D4253* (Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table),
- *ASTM D4254* (Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density).

All laboratory tests must be performed by a third-party laboratory with a current ASTM certification. CONTRACTOR shall also submit to OWNER all test results.

Prior to construction, CONTRACTOR shall provide the qualifications of an independent third-party testing laboratory to be approved by OWNER.

PART 2 PRODUCTS

2.1 SUBGRADE FILLER

Subgrade filler shall meet the following gradation requirements unless modified by the OWNER:

Passing 1½ inch sieve	100%
Passing 1 inch sieve	95 to 100%
Passing $^{3}/_{8}$-inch sieve	40 to 60%
Passing No. 4 sieve	20 to 40%
Passing No. 200 sieve	5 to 10%

Flowable fill may also be used as Subgrade Filler. If utilized, the flowable fill shall conform to the specifications provided in *SAWS ITEM No. 299 Flowable Fill*.

2.2 BEDDING MATERIAL

Bedding material shall be composed of well-graded crushed stone or gravel conforming to the following requirements unless modified by the OWNER. Such bedding is called “sewer gravel”. 3/8” diameter “pea gravel” will not be an acceptable alternative.

Passing 1½ inch sieve	100%
Passing 1 inch sieve	95% to 100%
Passing $^{3}/_{8}$-inch sieve	25% to 60%
Passing No. 4 sieve	0 to 10%
Passing No. 8 sieve	0 to 5%

Upon OWNER approval, flowable fill may also be used as Bedding Material. If utilized, the flowable fill shall conform to the specifications provided *SAWS ITEM No. 299 Flowable Fill*.

2.3 SELECT INITIAL BACKFILL

Select initial backfill shall conform to the gravel requirements of "*Subgrade Filler*" as specified in *Section 2.1*.

Upon OWNER approval, flowable fill may also be used as Select Initial Backfill. If utilized, the flowable fill shall conform to the specifications provided in *SAWS ITEM No. 299 Flowable Fill.* Additional requirements may be required for anchoring against buoyancy, which requires design by a licensed professional engineer, to be paid by the CONTRACTOR, and requires review and approval by OWNER.

Cohesionless materials may be used for backfilling. Use cohesionless materials that conform to the requirements of Table 1.

Table 1 - Cohesionless Material Gradation Limits

Sieve Size	Percent Retained
3″	0
#10	Note 1
#200	90–100

Note 1: No. 10 sieve requirements are 0 to 30% retained when used as aggregate for cement-stabilized backfill.

Compact cohesionless materials using vibratory equipment.

2.4 SECONDARY BACKFILL

Secondary backfill shall generally consist of materials removed from the trench and shall be free of roots, organics, or other degradable/deleterious material. Rock or stones having a dimension larger than 6 inches at the largest dimension shall be sifted out and removed before the material is used in the secondary backfill zone. Secondary backfill material shall be primarily composed of compacted soil materials. The soil material shall be placed and compacted in controlled lifts appropriate for the type of backfill, the type of compaction equipment being utilized, and compaction limits specified.

PART 3 EXECUTION

All existing utilities shall be protected from damage during the excavation and backfilling of trenches, and if damaged shall be replaced by the CONTRACTOR at CONTRACTOR'S expense.

Where construction is within the limits of the floodplain of a river, creek or stream, the CONTRACTOR is required to keep the floodplain clear of potential obstructions to flood flows. Potential obstructions include excavated material, waste material, stockpiled fill material, temporary roads, heavy construction equipment, etc. Under threatening weather conditions and where flooding is possible, obstructions shall be immediately removed by the CONTRACTOR.

3.1 EXCAVATION

The CONTRACTOR shall perform all excavation of every description and whatever substances

encountered, to the lines and grades shown on the plans or determined by the OWNER. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading, slides or cave-ins. All excavated material not required or suitable for backfill shall be removed and wasted as indicated on the drawings or as selected by the CONTRACTOR and approved by the OWNER. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.

Sheeting and shoring shall be installed as necessary for the protection of the work, adjoining property, and for the safety of the personnel. Unless otherwise indicated, excavation shall be by open cut, whether by hand, backhoe, ram-hoe, rock saw, or any method necessary. CONTRACTOR shall provide shoring plan to OWNER.

A. ARCHAEOLOGICAL

If the CONTRACTOR encounters any archaeological deposits during construction operations, the CONTRACTOR must stop excavation immediately and notify the OWNER. The CONTRACTOR cannot begin excavation again without written permission from the OWNER. If more than 5 working days are required for investigation, and if the CONTRACTOR cannot work in other areas of the project, the CONTRACTOR will be permitted to negotiate for additional construction time. The CONTRACTOR must submit a time extension request in writing within 10 working days of stopping work.

B. SAFETY

CONTRACTOR shall provide and maintain barricades, flags, lighting and other safety devices as required by local, state and federal codes and ordinances and conduct work to create a minimum inconvenience to the public. Temporary suspension of work does not relieve responsibility for the above requirements.

All excavations, trenching and shoring shall conform to *SAWS ITEM NO. 550 Trench Excavation Safety Protection.* CONTRACTOR shall at all times conform to all applicable regulations of the Occupational Safety and Health Administration's (OSHA) Excavation standards, *29 Code of Federal Regulations (CFR) Part 1926, Subpart P* and all applicable state and local rules and regulations.

3.2 TRENCHING

A. TRENCH SIDES

Walls should be vertical and the practice of undercutting at the bottom or flaring at the top will not be permitted unless specifically requested in writing by CONTRACTOR and allowed by OWNER. In special cases where trench flaring is permitted and directed by the OWNER, the trench walls shall remain vertical to a depth of at least 12 inches above the top of pipe. The bottom of the trench shall be square or slightly curved to the shape of the trenching machine cutters.

Where the CONTRACTOR has selected "sloping" and/or "benching" as the means of trench excavation protection, trench walls may be allowed that are other than vertical. Where the resulting trench width is wider than that normally required by this section of the specifications, a licensed professional

engineer in the state of Texas, who is hired by the CONTRACTOR, must submit engineering calculations showing that additional loadings do not result in the need for a stronger class of pipe. If the calculations show that a stronger class of pipe is required, all additional cost shall be borne by the CONTRACTOR.

Any voids created during the retention system removal, shall be backfilled by the CONTRACTOR by placing the backfill material in compacted lifts.

B. TRENCH BOTTOM

For rigid pipe and where suitable bedding exists, the bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe on the undisturbed soil at every point along its entire length.

For flexible pipe and/or rigid pipe on unsuitable bedding, the bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe on the minimum subgrade filler layer as established in the bedding requirements of this section, at every point along its entire length.

Bell holes and depressions for joints shall be dug after the trench bottom has been graded to allow for proper sealing of pipe joints and to allow the pipe to rest upon the prepared bottom for its full length.

Where over excavation occurs, the under-cut trench shall be restored to grade, to the satisfaction of the OWNER, by replacement of excavated material compacted to the same density as the surrounding natural ground or to the compaction level specified on the drawings or in the specifications at no additional cost to the OWNER.

Whenever wet or otherwise unstable soil that is incapable of properly supporting the structure or pipe, as determined by the OWNER, is encountered in the bottom of the trench, such soil shall be removed to the depth shown on the plans or determined by the OWNER and the trench backfilled to the proper grade with a subgrade filler layer as established in the bedding requirements of this section.

C. MINIMUM WIDTH OF TRENCH

Unless otherwise specified in the design drawings or specifications, the minimum width of pipe trench, measured anywhere between the bottom of the pipe and the top of the trench shall be 12 inches (6 inches per side) greater than the exterior diameter of the pipe, exclusive of bells. Minimum width shall accommodate backfill placement, compaction equipment, and testing. Exceptions apply at special structures, connections and at temporary structures such as trench supports.

D. MAXIMUM WIDTH OF TRENCH

Except as stipulated herein or on the plans, the maximum allowable width of trench for pipelines, measured anywhere in the pipe envelope (between the bottom of the pipe and 6 inches above the pipe) shall be the outside diameter exclusive of bells or collars) plus 24 inches (12 inches per side).

Within the pipe envelope, a trench wider than the outside diameter plus 24 inches may be used but must fully meet one of these requirements:

1. At the CONTRACTOR'S expense, he shall furnish and install pipe of the required strength to carry additional trench load. Such modifications and calculations shall be submitted in writing to OWNER by a licensed professional engineer in the state of Texas, hired by the CONTRACTOR, for approval. This requirement will not require special bedding or backfill unless required by the CONTRACTOR'S engineer.

2. Except as provided for on the drawings, specifications or by advance written approval of the OWNER, CONTRACTOR, at his expense, shall encase the pipe within the pipe envelope, from trench wall to trench wall, or encase in other pipe bedding material, with advance written approval from OWNER.

In Item 1 or 2, above, excavation wider than the stated minimum that also causes additional work of any kind, including additional pavement or removal and replacement of any surface amenity or utility, such additional work shall be at the CONTRACTOR's expense.

The maximum trench width above the pipe envelope will be governed by the trenching method and work requirements and limitations shown on the plans or included in these specifications.

E. UNACCEPTABLE BEARING MATERIALS

Where water, silt, muck, trash, debris, organics, rock, boulders or coarse gravel (particle size larger than 1¾ inch), or other degradable/deleterious material is encountered at the bearing level, the CONTRACTOR shall, as directed by the OWNER, excavate and remove such materials to a depth of not less than 6 inches below the bottom of the pipe and replace with a subgrade filler layer as established in the bedding requirements of this section.

F. DEWATERING AND CARE OF WATER

The CONTRACTOR shall take necessary steps to prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area. Also, the CONTRACTOR shall not allow water to accumulate in excavations or at changes detrimental to stability of subgrades and foundations. Accordingly, the CONTRACTOR shall:

1. Provide, install and maintain a dewatering (or surface diversion) system with components necessary to deter water from and convey water from excavations.

2. Convey water removed from excavation and rainwater to collecting or runoff areas, ditches and other diversions outside excavation limits. CONTRACTOR shall not use trench excavations as temporary drainage ditches or drainage conveyance devices.

3. Dewatering devices shall be provided by the CONTRACTOR with filters to prevent the removal of fines from the soil. Should the pumping system draw fines from the soil, the OWNER shall order immediate shutdown, and remedial measures will be the responsibility of the CONTRACTOR.

4. Upon completion of the dewatering work, the CONTRACTOR shall remove all equipment and leave the construction area in a neat and clean condition that is acceptable to the OWNER.

5. CONTRACTOR shall maintain ground water table at least 12 inches below the finished excavation subgrade.

6. Performance of the dewatering system shall be measured by observation wells and piezometers installed by the CONTRACTOR in conjunction with his dewatering system, and these shall be documented once a day, at a minimum. The CONTRACTOR shall maintain a log of these readings and submit them to the OWNER.

3.3 BACKFILLING

A. GENERAL

Trenches shall not be backfilled until the structures or appurtenances have been installed according to the project plans and specifications.

Where a trench has been improperly backfilled, or where settlement occurs, the identified section shall be excavated, in addition to 50 feet on each side. The section shall be excavated to the depth of pipe, then refilled and compacted to the grade and compaction required. The use of sand backfill shall not be allowed.

B. SANITARY SEWER BACKFILLING

Backfill for sanitary sewers is divided into 3 separate zones: (a) bedding material in trench bottom in direct contact with the bottom of the pipe, (b) select initial backfill extending from the surface of the bedding to a point 12 inches above the top of pipe, and (c) secondary backfill extending from the initial backfill surface to the top of the trench.

Unless otherwise specified in the standard details, the thickness of the bedding material will be determined by the outside diameter of the pipe as given in the following table, or as specified by the ENGINEER:

Pipe Outside Diameter (in.)	**Bedding Material Thickness (in.)**
Less than 30	3
30 to 60	4
Greater than 60	6

Flooding with water will not be accepted as a compaction method for subgrade filler, bedding material, or initial or secondary backfill.

1. SUBGRADE FILLER

a. Subgrade filler shall be placed to achieve at least 98% of the maximum density as

determined by *ASTM D698*.

2. BEDDING MATERIAL

   a. Existing stable materials and laying conditions encountered at the pipe bearing level which are acceptable for direct bedding purposes for rigid pipe are coarse sands and gravels with maximum particle size of 1¾ inch, various graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry, fine sands and clayey gravels, fine sand, sand/clay mixtures and gravel-clay mixtures.

   b. For flexible sewer pipe to be placed on all types of materials, or for rigid sewer pipe to be placed where unacceptable materials exist at the bearing level, the CONTRACTOR shall, as directed by the OWNER, excavate and remove existing materials to a depth of 6 inches or $^{1}/_{8}$ of the outside diameter of the pipe, whichever is greater, beneath the pipe bottom elevation. Bedding material shall be placed over the full width of the excavation between the undisturbed trench walls. The bedding material shall extend up the sides of the pipe sufficient to embed the lower quadrant of the pipe.

   c. Where the trench bottom has been over excavated beyond the limits defined in this specification due to blasting or removal of unstable material, the pipe shall be concrete encased. Encasement shall extend from the trench wall to trench wall and be a minimum of 6 inches above the top of pipe. No separate pay item.

   d. Where the trench bottom is not excavated in accordance with the specification due to rock or other hard underlying materials, then the pipe shall be concrete encased on all sides and to a minimum of 6 inches above the tope of pipe.

   e. Bedding material shall be consolidated from the bottom of the trench to the top of the pipe centerline.

   f. Bedding material shall be compacted to achieve at least 98% of the maximum density as determined by *ASTM D698*.

3. SELECT INITIAL BACKFILL

   a. Select initial backfill shall be used where the following exists in the initial backfill zone: water, silt, muck, trash, debris, rock, boulders or coarse gravel (particle size larger than 1¾ inch), or for all flexible pipes. Select initial backfill material shall conform to the requirements provided in section 2.3.
   b. For sewer lines less than 24 inches in diameter, select initial backfill material shall be placed in equal lifts not exceeding 8 inches in loose lift thickness. The first lift shall be spread uniformly and simultaneously on each side and under the shoulders of the pipe to its spring line. The first lift of select initial backfill shall be inspected and approved prior to placement of the second lift. The second lift shall extend from the spring line of the pipe to a compacted depth of 12 inches above the top of pipe. The second lift shall be spread in a similar manner as the first lift.
   c. For sewer lines 24 inches in diameter and larger, select initial backfill material shall

be evenly spread alongside, under the haunches of the pipe and over the pipe in maximum 8-inch loose lifts to a compacted depth of at least 12 inches above the top of pipe.

d. Each layer of backfill must provide the density as indicated on the drawings or in the specification. Soils shall be watered as required to provide no more than four percent over optimum moisture content and compacted to the extent shown on the plans. The in-situ density of surrounding natural ground adjacent to trench walls will not be considered in establishment of control densities.

e. Select initial backfill shall be compacted to achieve at least 98% of the maximum density as determined by *ASTM D698*.

4. SECONDARY BACKFILL

a. Secondary backfill is defined as backfill from 12 inches above the top of pipe to the top of the trench, unless otherwise defined in the construction drawings.

b. The secondary backfill material shall be placed in maximum 8-inch loose lifts or as directed by OWNER.

c. All compaction within the secondary backfill zone shall be a minimum of 98% compaction at + or -2% optimum moisture content as per the latest provisions of the *TxDOT Testing Method Tex 113-E*, unless otherwise shown in the project plans.

d. The depth of layers, prior to compaction shall depend on the type of watering and compacting equipment used to achieve the required density and the test results thereby obtained and shall be a maximum of 8 inches.

5. SEEPAGE RETAINERS

To prevent piping and/or seepage along the bedding and initial backfill zones, where porous material including subgrade filler is used for backfill, concrete seepage retainers, unless otherwise indicated in the construction drawings, are required at an approximate spacing of 180 feet. Retainers are also required 20 feet upstream and downstream of each manhole installation or where groundwater seepage is encountered during construction, as applicable. As a minimum, seepage retainers shall be 18 inches thick, extend 6 inches into the trench sidewalls and subgrade, and extend the full height and width limit of bedding and initial backfill. Seepage retainers are similar to sand migration prevention collars and shall consist of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class B* concrete encasement.

6. TRENCH SURFACE RESTORATION

a. The surface of the backfilled trench shall be restored to match the previous existing conditions. This shall include final grading, placement of topsoil and seeding, placement of sod (such as at homes or businesses that have maintained lawns), or other unprepared and prepared surfaces.

b. Natural ground shall be in accordance with native seeding or sodding (refer to specification section)

c. All pavement and alley restoration shall be in accordance with applicable jurisdictional authority requirements. Included in this requirement is replacement of any curbs, sidewalks, flatwork, or other grade supported features damaged or removed during the construction.

7. DISPOSAL OF EXCAVATED MATERIALS

Excess excavated material, not utilized after all fill requirements have been met, shall become the property of the CONTRACTOR and he shall dispose of it by hauling and wasting outside the limits of the right of way of the project and of public thoroughfares and water courses, in conformity with pertinent city, county, state and federal codes and ordinances and in a manner meeting the approval of the OWNER.

3.4 QUALITY CONTROL/ASSURANCE

A. The CONTRACTOR shall procure, store and place materials from either onsite or offsite sources which comply with the specified requirements.

B. Quality Assurance Testing: The OWNER shall have such tests and inspections as they may desire performed by a nationally accredited independent testing laboratory for guidance and control of the work. Payment for such tests shall be the responsibility of the CONTRACTOR, to be billed to the CONTRACTOR, including the material laboratory compaction tests and field density tests. The CONTRACTOR shall provide access to the test area, associated trench excavation safety protection and backfilling of the test areas. The frequency and location of testing shall be determined solely by the OWNER but will be a minimum of 1 compaction test per 1,000 linear ft on each lift. The OWNER may test any lift of fill at any time, location or elevation.

C. Quality Control Testing: The CONTRACTOR shall be responsible for compaction in accordance with the appropriate specification. Compaction tests will be done at one location point randomly selected or as indicated by the OWNER, per 8-inch loose lift per 400 feet, at a minimum. The OWNER shall determine the depth at which the density test shall be taken. The costs for all quality control testing shall be the responsibility of the CONTRACTOR.

In-place density tests shall be conducted by a nationally accredited independent testing laboratory. The frequency and location of testing shall be in accordance with the following table:

Secondary Backfill Depth (Ft)	Number of Tests per 400 Linear Feet
0-6	3
6-12	5
>12	7 or as directed by the Engineer

Any failed test shall require the CONTRACTOR to remove and replace or rework as required the layer of backfill to points hallway to the next test location at no additional cost. Retests of these areas shall be at the CONTRACTOR's expense.

The CONTRACTOR shall provide access to the test area, associated trench excavation safety protection, and backfilling of the test areas at the CONTRACTOR's expense.

D. CONTRACTOR shall be responsible for all costs associated with supplying material for the proctor and density tests. These tests shall be performed by a nationally accredited, independent testing laboratory. The CONTRACTOR shall provide access to the results of the material proctor tests to the OWNER prior to performing any backfill operations.

E. If material fails to meet the density indicated, the course shall be reworked as necessary to obtain the indicated compaction and the compaction method shall be altered on subsequent work to obtain the indicated density. At any time, the OWNER may order proof rolling to test the uniformity of compaction of the backfill layers. All irregularities, depressions, weak or soft spots which develop shall be corrected immediately by the CONTRACTOR.

F. The test requirements listed in this section are indicated as minimum requirements. There may be more stringent requirements established by other jurisdictional agencies (such as City or County Jurisdiction, TxDOT, etc.)

G. Any failed test shall require the CONTRACTOR to remove and replace that layer of backfill to 50 feet from either side of the failed test location. The CONTRACTOR will also be required at no cost to the OWNER, to provide two additional tests at the replaced location where the initial test failed, and at one location point randomly selected by OWNER.

H. The CONTRACTOR shall provide access to the test area, associated trench excavation safety protection and backfilling of the test areas at CONTRACTOR'S expense.

I. The CONTRACTOR will determine in-place density and moisture content by any one or combination of the following methods: *ASTM D2922* (density of soil and soil aggregate in-place by nuclear methods – shallow depth), *D1556* (lab density of water content of soil and rock), *D3017* (water content of soil and rock – shallow depth in-place by nuclear methods).

PART 4 MEASUREMENT AND PAYMENT

Excavation, trenching, backfilling, dewatering and trench surface restoration will be considered subsidiary to the amount bid for *Section 33-31-00 - Sanitary Sewers*. Measurement and payment shall include full compensation for furnishing all materials, trenching, pumping, bedding, haunching, initial backfilling, secondary backfill, concrete or seepage retainers, concrete encasement for unsuitable bedding materials, laying and jointing tamping, temporary pavement, seeding, sodding, water, labor, tools, equipment and other incidentals necessary to complete the work.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-06
SANITARY SEWER TESTING

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 - Submittals
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-01-31 - Sewer Main TV Inspection

B. SCOPE:

Sanitary sewer lines shall be tested by the CONTRACTOR on completed sections. The air and mandrel tests results will be used to evaluate materials and construction methods on the pipeline sections, and successful tests shall be mandatory for the acceptance of the lines.

C. SUBMITTALS:

Prior to the start of testing, CONTRACTOR shall submit, for OWNER'S approval, the following:

1. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval. Include testing procedures, methods, equipment, and tentative schedule.
2. Deviations from Drawings and Specifications shall not be accepted unless written approval is provided by OWNER.
3. Submit all preliminary and final testing reports for each test conducted.

PART 2 PRODUCTS

2.1 MATERIALS:

A. A compressor capable of providing at least three-hundred (300) cubic feet per minute (cfm) at one-hundred (100) pounds per square inch (psi) shall be furnished by the CONTRACTOR.

B. Plugs, valves, pressure gauges, air hose, connections, control panel and other equipment necessary to conduct the air test shall be furnished by the CONTRACTOR.

C. Mandrel equipment shall be submitted for approval prior to testing.

PART 3 EXECUTION

3.1 GENERAL:

A. Testing can be performed by a professional engineer licensed in the State of Texas with prior approval by the OWNER. If the OWNER is not witnessing the testing, documentation of passing tests must be signed and sealed by an engineer and submitted to the OWNER.

B. If a gravity collection main is composed of flexible pipe, a deflection test will also be required.

C. If installing a lateral to connect to an existing sanitary sewer main that has five (5) or more laterals connected, additional testing will be required.

3.2 AIR TEST PROCEDURES:

A. The procedures for the low-pressure air test shall 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 time shall be as outlined in this section.

B. Clean the sewer to be tested and remove all debris where indicated. Wet the sewer prior to testing. Backfilling to grade shall be completed and all laterals, stubs, and openings shall be capped or plugged by the CONTRACTOR before the test. Manholes are to be plugged so they are isolated from the pipe and cannot be included in the test. Under no circumstances is one section of pipe or material (i.e. ductile iron pipe) to be tested with another pipe section or material (i.e. PVC pipe) at the same time. Different sections of pipe are to be tested separately.

C. For sections of pipe less than 36-inch average diameter, the maximum time allowable for the pressure to drop from 3.5 pounds per square inch gauge (psig) to 2.5 psig shall be computed by the following equation:

$$T = \frac{0.085(D)(K)}{Q}$$

T = Time for the pressure to drop 1.0 psig in seconds
K = 0.000419 (D)(L), but not less than 1.0
D = Average inside pipe diameter in inches
L = Length of line of same pipe size being test, in feet
Q = Rate of loss, assume 0.0015 cubic feet per minute per square foot internal surface shall be used since a K value of less than 1.0 shall not be used.

D. Allowable test times for selected type pipe less than 36 inches average inside diameter shall be as follows:

Pipe Diameter (inches)	**Minimum Time (seconds)**	**Length for Minimum Time (feet)**	**Time for Longer Length (seconds/foot)**
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 has transpired.

E. The OWNER may stop a test 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 a testing period, then the test must continue for the entire test duration as outlined above or until failure.

F. When a main line with connected laterals is to be tested as a unit or when the line tested includes more than one pipe size, calculate the test times for each size and add the test times to arrive at the total minimum test time for the section. Any drop in pressure, from 3.5 psig to 2.5 psig greater than average back pressure of any ground water as required by the above table or formulas shall be cause for rejection. The CONTRACTOR must determine the cause of test failure and repair as may be required to accomplish a successful air test.

G. Test over individual joints or "joint tests" shall be performed in the same manner as stated herein with the minimum allowable test time determined from the above table or formulas for a minimum of ten (10) feet of length. Pipes sizes 36 inches inside diameter and larger shall be "joint tested", and each joint shall be visually inspected immediately after testing. Pipes under 36 inches inside diameter may be "joint tested" with the approval of the OWNER. Maximum time allowable for the pressure to drop shall be 20 seconds regardless of pipe size.

3.3 DEFLECTION TESTING

A. For a collection system pipe with an inside diameter less than 27 inches, deflection measurement requires a rigid mandrel.

B. The rigid mandrel shall have an outside diameter (O.D.) not less than 95% of the inside diameter (I.D.) of the pipe.

C. Mandrel Design:

1. The rigid mandrel shall be constructed of a metal that can withstand 200 psi without being deformed.

2. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number.

3. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe.

4. A proving ring shall be provided and used for each size mandrel in use.

B. Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test.

C. A deflection test method must be accurate to within plus or minus 0.2% deflection.

D. The test shall be conducted 30 days after backfill has been placed and trench has been fully compacted.

E. Other underground utilities, such as, but not limited to water, gas, electric, and telecom, that are within the vicinity of the sanitary sewer line must be installed prior to testing.

F. No pipe shall exceed a deflection of 5%.

G. If a pipe should fail to pass the deflection test, the problem shall be corrected, and a second test shall be conducted after the failed area's final backfill has been in place an additional 30 days.

H. The tests shall be performed without mechanical pulling devices.

I. Upon completion of construction, the OWNER or other Texas Registered Professional Engineer appointed by the OWNER shall certify that the entire installation has passed the deflection test.

J. This certification may be made in conjunction with the notice of completion required in *TCEQ Chapter 217.14*.

K. This certification shall be provided for the OWNER to consider the requirements of the approval have been met.

3.4 VACUUM TESTING FOR SANITARY SEWER MANHOLES

A. Successful passage of a vacuum test shall be required for acceptance of all sanitary sewer manholes and sanitary sewer structures. Vacuum testing shall be conducted using an OWNER approved vacuum tester.

B. CONTRACTOR shall notify the OWNER 48-hours prior to testing and only after a successful pre-test has been performed. Pre-testing after connections is made but before backfilling is recommended to facilitate better and easier repair if required.

C. The following procedures shall be followed:

1. Plug all manhole inverts and lift holes. Inverts shall be plugged using suitably-sized pneumatic or mechanical pipeline plugs. The plugs shall be placed a minimum of six inches (6") beyond the manhole wall to prevent temporary sealing of the inverts. Follow all manufacturer's recommendations and warnings for proper and safe installation of such plugs. Make sure such plugs are properly rated for the pressure required for the test. The standard test of ten inches of mercury(inHg) is equivalent to approximately 5 PSIG (0.3 bar) back pressure. Unless such plugs are mechanically restrained, it is recommended that the plugs used have a two-times (2X) safety factor or a minimum 10 PSIG (0.7 bar) back pressure using rating. Caution: Brace inverts if lines entering the manhole have not been backfilled to prevent pipe from being dislodged and pulled into the manhole.

2. Install the vacuum tester head assembly at the top access point of the manhole, preferably the ring area. Adjust the cross brace to ensure that the inflatable sealing element inflates and seals against the straight top section of the manhole structure. Do not pressurize the manhole – this may result in manhole damage and/or result in manhole test plug dislodging from manhole inlet.

3. Attach the vacuum pump assembly to the proper connection on the test head assembly. Make sure the vacuum inlet/outlet valve is in the closed position.

4. Following all safety precautions and manufacturer's instructions, inflate sealing element to the recommended maximum inflation pressure. Do not over-inflate

5. Start the vacuum pump assembly engine and allow preset RPM to stabilize.

6. Open the inlet/out ball valve and evacuate the manhole to ten-inch (10") Hg (0.3 bar).

7. Close vacuum inlet/out ball valve, disconnect vacuum pump, and monitor vacuum for the specified time period. If the vacuum does not drop more than 1-inHg over the specified time period, the manhole is considered acceptable and passes the test.

VACUUM TEST TIME TABLE			
	DIAMETER (INCHES)		
Depth (feet)	48"	60"	72"
4	10 sec.	13 sec.	16 sec.
8	20 sec.	26 sec.	32 sec.
12	30 sec.	39 sec.	48 sec.
16	40 sec.	52 sec.	64 sec.
20	50 sec.	65 sec.	80 sec.
24	60 sec.	78 sec.	96 sec.
*	05 sec.	6.5 sec.	8.0 sec.
* Add indicated times for each additional 2' depth. (The values listed above have been extrapolated from ASTM designation C924-85)			

8. If the manhole fails the test, identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Leaking areas will have soapy bubbles. Once the leaks have been identified, complete all necessary repairs and repeat test procedures until satisfactory results are obtained. Repeat the above test procedure after backfilling for final acceptance test.

D. Alternate manhole testing

1. Manholes may be hydrostatic tested as an alternate to vacuum testing if approved by the OWNER.

2. Hydrostatic testing shall be conducted using OWNER approved plugs for all influent and effluent pipes in the manhole and filling the manhole with water to the top of the manhole cone.

Additional water may be added over a twenty-four (24) hour period to compensate for absorption and evaporative losses.

3. At the conclusion of the twenty-four (24) hour saturation period, the manhole shall be filled to the top of the manhole cone and observed. Any loss within a thirty (30) minute period shall be considered an unsuccessful test.

E. CONTRACTOR to ensure all plugs used to plug sewer lines, while testing the project (such as air plugs, screw type plugs, etc.) are labeled, marked or tagged. OWNER will record how many plugs are being used, location and I.D., within the collection system. CONTRACTOR will report to OWNER of any lost or unrestrained plugs into the sewer collection system.

F. CONTRACTOR will be held liable for any damages to sewer collection system stoppages, over-flows, backup into homes caused by lost, run-away sewer plugs that were used on that project or outfall line wastewater treatment plants.

G. CONTRACTOR will also be responsible for any damage to wastewater treatment apparatus, such as screw pumps, etc. caused by lost or run-away sewer plugs. CONTRACTOR will be held liable for damages as well as cost of repairs.

PART 4 MEASUREMENT AND PAYMENT

No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section. The costs for all such items required shall be considered subsidiary to other items of this contract and shall not be paid for separately.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-07
JACKING, BORING OR TUNNELING PIPE

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 31-50-00 - Trench Excavation Protection
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-05-06 - Sanitary Sewer Testing
Section 33-31-00 - Sanitary Sewers
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 301 Reinforcing Steel
SAWS ITEM NO. 550 Trench Excavation Safety Protection
SAWS ITEM NO. 307 Concrete Structures

B. SCOPE:

This item shall govern for the furnishing and installation of pipe by the methods of jacking, boring, or tunneling as shown on the plans and in conformity with this specification. All work within the City Street, County Street, State highway, or railroad right of way must meet the requirements in this section as a minimum and shall meet the requirements of the permit issued by the City, County, State or Railroad Owner when their requirements are more stringent. Approval of all completed work in the right of way must be obtained from the OWNER prior to final acceptance.

C. SUBMITTALS:

CONTRACTOR shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

The Contractor must submit a jacking plan for approval by the OWNER.

The CONTRACTOR must submit a boring plan for approval by the OWNER.

PART 2 PRODUCTS

2.1 PIPE:

For sanitary sewers, materials shall conform to the OWNER’s approved product list, *Section 333100 - Sanitary Sewers*, or as specified on the plans and specifications provided by the OWNER.

2.2 CASING SPACERS:

All products shall conform to the OWNER'S approved product list. The CONTRACTOR should review this list prior to start of construction.

2.3 CASING PIPE:

Material, length, and thickness specified on project plans.

2.4 GROUT:

Grout for annular spaces shall be sand cement slurry containing a minimum of seven (7) sacks of Portland Cement per cubic yard of slurry. All slurry shall be plant batched and transit mixed.

PART 3 EXECUTION

3.1 JACKING:

A. Suitable pits or trenches shall be excavated for the purpose of jacking operations. When pits or trenches are cut such work shall in no way interfere with the operation of railroads, streets, highways or other facilities and shall not weaken or damage such facilities. Barricades, lights, signs and other warning devices shall be provided at the CONTRACTOR'S expense according to the regulations established in the TxDOT "Texas Manual on Uniform Traffic Control Devices" to safeguard traffic and pedestrians. CONTRACTOR shall also follow all OSHA trench safety rules and regulations.

B. The pipe to be jacked shall be set on guides to support the section of pipe being jacked and to direct it in the proper line and grade. Earthen material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the opening thus provided.

C. The excavation for the underside of the pipe, for at least one-third (1/3) of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than two inches (2") may be provided for the upper half of the pipe. If voids should develop, or if the excavation is greater than the outside diameter of the pipe (including coating) by more than one inch, as determined by the OWNER, the space shall be filled by pressure grouting with a grouting method approved by the OWNER.

D. The distance that the excavation shall extend beyond the end of the pipe shall depend on the character of the material, but it shall not exceed two feet (2') in any case.

E. Generally, the pipe shall be jacked from downstream end. Permissible lateral or vertical variation in the final position of the pipe from line and grade shall be within $\pm$3 inches of plan grade on the upstream end of the bore, or as determined by the OWNER.

F. Any pipe damaged in jacking operations shall be removed and replaced at the CONTRACTOR'S expense.

G. All carrier pipe placed in casing shall be supported with bolt on style casing spacers as shown in the plans and specified herein.

H. The pits or trenches excavated to facilitate this operation shall be backfilled immediately after work has been completed and inspected by OWNER. Backfilling shall conform to *Section 330505 - Sewer Excavation, Trenching and Backfilling*.

3.2 BORING:

A. Excavation for Boring pits and installation of shoring shall be as outlined under Jacking. The boring shall be done using a pilot hole. The pilot hole shall be bored the entire length of the crossing and shall be used as a guide for the larger hole to be bored. The use of water or other fluids in connection with the boring operation will be permitted only to the extent to lubricate cuttings; jetting will not be permitted.

B. Variation in line and grade shall apply as specified under Jacking. Pressure grouting requirements and procedures are the same as specified under Jacking.

C. All carrier pipe placed in casing shall be installed as outlined under Jacking.

D. Backfilling of pits and trenches shall apply as specified under Jacking.

3.3 TUNNELING:

A. Tunneling may be used when the size of the proposed pipe or the use of a monolithic sewer would make the use of tunneling more satisfactory than "Jacking or Boring"

B. The excavation for pits and the installation of shoring shall be as specified under Jacking.

C. The lining of the tunnel shall be of the material shown on the plans.

D. Pressure grouting requirements and procedures are the same as specified under Jacking.

E. All carrier pipe placed in casing shall be installed as outlined under Jacking.

F. Backfilling of pits and trenches shall apply as specified under Jacking.

3.4 CASING END PLUGS:

A. Casing shall be plugged on both ends before backfilling. Plugs shall consist of minimum of 2 LF of low strength grout (1,500 psi minimum). The plug shall create a watertight seal between the casing and the carrier pipe. Any casing spacers within the grouted sections shall be greased or treated otherwise to prevent bonding of the grout to the casing spacer.

3.5 TRENCH PROTECTION:

All excavation and trenching shall conform to *SAWS ITEM NO. 550 Trench Excavation Safety Protection*.

PART 4 MEASUREMENT AND PAYMENT:

A. Materials and installation will be measured in the field and the linear feet considered for payment will be the actual horizontal distance installed, from beginning of the casing to the end of the casing. Materials on hand will not be paid. Measurements exceeding the proposal quantity will not be considered for payment unless approved by OWNER in writing in advance.

B. This item will be paid for at the contract linear foot unit price bid for "Jacking, Boring or Tunneling Pipe" for the diameter of pipe indicated as based on the actual horizontal distance, which price shall be full compensation for the work specified including line cleaning, air testing and television inspection.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-63
CONCRETE ENCASEMENT, CRADLES, SADDLES AND COLLARS

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 301 Reinforcing Steel
SAWS ITEM NO. 307 Concrete Structures

B. SCOPE:

This item shall govern for placing concrete encasements, cradles, saddles and collars, when called for by the plans, or as directed by the OWNER.

PART 2 PRODUCTS

2.1 CONCRETE:

A. All concrete shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Class B)* or shall be of the class as noted on the plans. Backfill on top of concrete shall not begin until concrete has achieved eighty percent (80%) of the minimum design strength.

PART 3 EXECUTION

3.1 CONCRETE ENCASEMENT

A. When concrete encasement is shown on the plans or when directed by the OWNER, the trench shall be excavated and fine graded to depth conforming to details and sections shown on the plans.

B. The pipe shall be supported by precast concrete blocks of the same strength as the concrete for encasement and securely tied down to prevent floatation.

C. Encasement shall then be placed with a minimum concrete thickness of six inches (6") in any direction from the outside diameter of the pipe.

3.2 CONCRETE CRADDLES

A. When concrete cradles are shown on the plans or when called for by the OWNER, the trench shall be prepared, and the pipe supported in the same manner as described in this specification and shall be constructed in accordance with details and sections shown on the plans.

B. Straps/Tie Downs shall be of No. 4 rebar diameter minimum or better as determined by the OWNER.

3.3 CONCRETE SADDLES

When shown on the plans or when directed by the OWNER, pipe to receive concrete saddle shall be backfilled in accordance with *Section 330505 - Sewer Excavation, Trenching and Backfilling* to the spring line and concrete placed for a minimum depth and width clearance of six inches (6") around the pipe.

3.4 CONCRETE COLLARS:

When shown on the plans or when directed by the OWNER, concrete collars shall be constructed with a minimum concrete thickness of six inches (6") in any direction from the outside diameter of the pipe and with a minimum length of two feet (2'), unless otherwise specified in the construction drawings.

PART 4 MEASUREMENT AND PAYMENT

Except when said items are subsidiary to other pay items, this pay item will be measured by the unit price bid per cubic yard of accepted work, complete in place. Reinforcing, if required, shall not be measured for payment.

No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section for construction of cradles, saddles, and collars. The costs for all such items required shall be considered subsidiary to other items of this contract and shall not be paid for separately.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-61
STANDARD SANITARY SEWER MANHOLES

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-01-31 - Sewer Main TV Inspection
Section 33-05-06 - Sanitary Sewer Testing
Section 33-05-07 - Jacking, Boring or Tunneling Pipe
Section 33-31-00 - Sanitary Sewers
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 301 Reinforcing Steel
SAWS ITEM NO. 550 Trench Excavation Safety Protection
SAWS ITEM NO. 851 Existing Manhole Adjustment

B. SCOPE:

This item shall govern the construction of standard sanitary sewer manholes. Manholes shall be constructed with materials and workmanship described in this specification and plan details, and at the locations shown on the plans or designated by the OWNER. All materials and construction work shall be in accordance with current *Texas Commission on Environmental Quality (TCEQ) Chapter 217 – Design Criteria for Domestic Wastewater Systems.*

C. SUBMITTALS:

Prior to the start of construction, CONTRACTOR shall submit, for OWNER'S approval, the following items being proposed for construction:

1. Manholes
2. Rings and covers
3. Gaskets
4. Pipe to manhole connectors
5. Infiltration dishes
6. Coatings

All submittals shall be in conformance with *Section 01-33-00 – Submittals*.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise shown on the plans and details or as approved by the OWNER, standard sanitary sewer manholes shall be constructed with precast reinforced concrete manhole sections.

B. Manholes shall be a single-maintenance entrance cylindrical structure having a uniform internal diameter of 4 feet, 5 feet or 6 feet from the base of the structure to the bottom of the diameter adjustment section or cone. The base of the structure shall include the load bearing portion beneath and outside of the structure, invert channels and the fill or bench portions adjacent to the lower sewer pipes within the structure as shown on the plan details. The vertical height of the diameter adjustment section or cone shall be between 24 inches and 36 inches. Adjustment or throat rings may be used for elevation adjustment of the manhole ring and cover.

All products shall conform to the OWNER'S Approved Products List. It is the CONTRACTOR's responsibility to request this list from the OWNER. The CONTRACTOR should review this list prior to start of construction.

2.2 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS

A. Precast reinforced concrete manhole sections shall conform to the requirements of *ASTM C478*. The precast sections shall have rubber gasket compression joints conforming to the material and performance requirements of *ASTM C443*.

2.3 PRECAST CONCRETE MANHOLE BASE

A. A steel reinforced concrete base shall be used with precast concrete manhole sections. This base shall be furnished with confined O-ring joints in conformance with *ASTM C443*. The reinforced concrete precast manhole base shall be manufactured in accordance with *ASTM C478*. The precast base shall have formed smooth invert channels cast at the angles which are indicated on the plans. The invert channel shall, unless otherwise required by the plans and specifications, have 3 inches of fall toward the outlet. Inverts shall be designed and constructed to prevent reverse flow.

2.4 PIPE TO MANHOLE CONNECTORS

A. Pipe to manhole joint connectors shall be installed to create a watertight seal between the manhole base and sewer line. The pipe to manhole connection shall be made with an approved product listed by the OWNER. This joint shall comply with *ASTM C923*.

2.5 GROUT

A. Concrete Grout: All concrete grout used for patching or other similar fill-in work shall be of non-shrink type in accordance with the manufacturer's recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce a compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 ºF baseline temperature.

A non-shrinking cement additive shall be added to reduce cracking and shrinkage, refer to the approved product list.

2.6 MANHOLE RINGS AND COVERS

A. Watertight manholes are required unless otherwise approved by OWNER. Watertight manhole rings and covers shall be cast iron with 400-pound minimum combined weight, 6 inches total height, and 30 inches minimum ring inside diameter. Covers shall contain no holes or openings except as required for bolts. Two lifting bars with slots adequate for pick insertion shall be cast into the cover for lifting purposes. Covers shall seat on a minimum $^{5}/_{16}$-inch diameter rubber ring gasket conforming to the material requirements of *ASTM C443*. The rubber gasket shall rest in a groove cast in the ring inside of the bolts. Four $^{5}/_{8}$-inch diameter stainless steel, hex head bolts shall be provided for each cover and two (2) bolts shall be manhole locks. The 4 bolts in the covers shall be evenly spaced and provided with a minimum of 1½ inch diameter counter sink for the bolt heads. In the fastened and bolted position, the bolt heads shall not extend beyond the surface of the cover. Gaskets of a size and material as approved by the OWNER shall be provided for the bolts to ensure air and water tightness. Alignment marks shall be cast onto watertight rings and covers for proper bolt alignment.

B. Finished frames and covers shall have the bearing surfaces machine ground and sets of rings and covers shall be marked in such a way that they can be matched for assembly in field.

C. All covers shall have the words “San Antonio River Authority” and “Sanitary Sewer” cast thereon, as shown on RIVER AUTHORITY *Standard Detail SD404*, Sheet 7 of 7.

D. Manhole rings and cover shall meet the current requirements of the *American Association of State Highway and Transportation Officials (AASHTO) Designation M306-10.*

E. Manholes shall be vented in accordance with *TCEQ Chapter 217 – Design Criteria for Domestic Wastewater Systems*. Vented manholes shall have a 1” hole in the center of the cover where applicable/or watertight/bolt down. All vented manholes shall be equipped with infiltration dishes.

2.7 INFILTRATION DISHES

A. Infiltration dishes will be required locations designated on the project plans, or as directed by OWNER. The CONTRACTOR shall be responsible for making the necessary field measurements for the manufacturer prior to production.

2.8 CONCRETE

All concrete for manholes shall conform to the provisions *of SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A.*

2.9 REINFORCING STEEL

All reinforcing steel shall conform to the provisions of *SAWS ITEM NO. 301 Reinforcing Steel.*

2.10 THROAT RINGS

A. Adjustment throat rings shall be reinforced concrete rings having a maximum thickness of two inches (2”). The concrete ring reinforcement steel shall be a minimum of No. 2 wire. The internal diameter shall not be less than thirty inches (30”) and the width shall be a minimum of five inches (5”). Concrete shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A* specification.

B. A minimum of one and a maximum of four throat rings will be used at each manhole for adjustment.

C. If concrete throat rings are to be installed, they must be used in conjunction with a UV stabilized polyethylene liner and I/I barrier.

2.11 INFLOW AND INFILTRATION (I/I) BARRIER

A. The I/I Barrier shall meet the following ASTM standards: *ASTM D790* for flexural properties; *ASTM D1505* for density; *ASTM D1238* for Melt Flow Index; *ASTM D638* for tensile strength at yield (50mm/mm); *ASTM D790* for flexural modulus; *ASTM D648* for heat deflection temperature at IGEPAL; and *ASTM D693* for EsCR, 100% IGEPAL/10% IGEPAL.

2.12 BITUMASTIC JOINT SEALANT

A. Bitumastic Joint Sealant is to be applied between cones, risers, adjustment rings, flat tops, and between the ductile or gray cast iron ring (frame) and the uppermost adjustment ring or flat top.

2.13 EXTERNAL RUBBER SLEEVE

Before backfilling, compacting or concrete encasing any manhole joint section risers, cone sections or grade rings, they shall be wrapped with an external rubber sleeve having a minimum thickness of 60 MILs.

2.14 COATING

D. All new manholes shall have the interior walls coated with a coating approved by OWNER.
E. All re-constructed manholes shall be coated with a minimum of 1” thick cementitious, then epoxy coated with thickness specified by manufacturer.

F. Application procedures shall be in accordance with Manufacturer’s recommendation and as per the following:

1. CONTRACTOR shall ensure manhole entry complies with *OSHA, 29 CFR 1910.146*.

2. CONTRACTOR shall notify the OWNER’s inspector a minimum of 48 hours prior to the start of any field surface preparation work.

PART 3 EXECUTION

3.1 PRECAST MANHOLES

Footings or bases of manholes shall be a minimum 6 inches below the bottom of the pipe. Reinforcing steel is required to be placed in the concrete as per *SAWS ITEM NO. 301 Reinforcing Steel* . All manhole bases shall be installed as specified in *Section 330505 - Sewer Excavation, Trenching and Backfilling*.

A. The CONTRACTOR shall level and plumb the base prior to setting the precast manhole riser sections on the precast concrete base. Concrete cradles shall not be required for precast concrete manhole bases which utilize resilient or compression joints as shown on the plans and details. Concrete cradles shall extend beyond the outside walls of the manhole a minimum of thirty-size inches (36”).

B. The top half of all sewer pipes within the invert channel or bench zone shall be removed flush to the inside manhole walls.

C. Joints on sewer pipe shall not be cast or constructed within the wall sections of manholes. Gasket and joint surfaces on recessed O-Ring joints shall be lubricated with a lubricant suitable for use with confined rubber O-Ring concrete pipe joints. Dust, dirt and foreign matter must be removed from the joint surfaces. Lubricant can be applied with a brush, cloth pad, sponge or glove. A smooth round object should be inserted under the gasket and run around the circumference two or three times to equalize stretch in the gasket.

D. On new sewer manhole and pipe systems and new pipe systems connecting to existing manholes, pipes entering a manhole above the lowest pipe shall project two inches (2”) from the inside wall. Such pipes shall be installed with a joint a minimum of twelve inches (12”) from the outside manhole wall. A concrete cradle shall be provided for the pipe extending from the manhole wall a minimum distance of thirty-six (36”) on those manholes which do not utilize precast concrete manhole bases with compression or resilient joint connectors

E. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, concrete or mortar as approved by the OWNER or as shown on the plan details and inspected prior to backfilling.

F. Where connections to existing manholes are required, the adjacent pipe bedding shall be prepared to proper grade, the existing manhole neatly cut, and the new pipe inserted so that the end is projecting two inches (2”) from the inside wall. The invert shall then be re-shaped to properly channel new flows. Debris of any kind shall be kept out of new or existing manholes or mains.

G. Connections to existing manholes require rehabilitation of the existing manhole to current specifications, including re-encasement, re-coating, and updating manhole rings and covers.

H. The CONTRACTOR shall be required to backfill all new manholes with an approved flowable backfill up to 1 foot above the cone section, or in accordance with the requirements of the right-of-way owner having jurisdiction. Manhole shall be inspected prior to flowable fill placement. If

inspection has not been conducted, CONTRACTOR shall remove flowable fill for inspection.

I. Throat rings shall be mortared between all bearing surfaces sufficient to provide a minimum, in place, mortar thickness of one-quarter inch (1/4”). No more than four (4) or less than two (2) throat rings may be used on any manhole.

3.2 MANHOLE RING ENCASEMENT

All manhole rings shall be encased with non-reinforced concrete as shown in plan details or as approved by the OWNER, unless constructed within an existing or proposed roadway. Encasement shall be circular, unless approved by OWNER. Encasement shall be finished level and have a broom or smooth finish.

A. Concrete for concrete encasement around manholes which are not in new or existing street shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class B concrete.*

B. Concrete. Manhole ring encasement shall have a minimum depth of twenty-eight (28”) inches with a minimum depth of twenty inches (20”) below the top of the manhole diameter adjustment cone and a minimum thickness when measured at the manhole ring of one foot (1’). The surface of the encasement shall be not more than three inches (3”) below the top of the manhole ring.

C. Concrete for concrete encasement around manholes which are in new or existing streets shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A concrete*. See standard detail for dimensions.

D. Where manholes are to be adjusted in new or existing streets in accordance with *SAWS ITEM NO. 851 Existing Manhole Adjustment*, the concrete replacement for base and subgrade materials may be used in lieu of the encasement above.

E. Where manholes are constructed in existing streets and where directed by the OWNER or shown on the plans, the exterior exposed surfaces of the ring, mortar, throat rings and manholes surface shall be covered with an external rubber sleeve.

3.3 DROP MANHOLES

A drop pipe of the same pipe material and size shall be provided for a sewer pipe entering a manhole more than twenty-four inches (24”) above the invert. The drop pipe shall be constructed on the outside of the manhole utilizing fittings per detail to provide a smooth drop and a clean out leg as shown on the detail sheet or plans. The drop pipe shall be encased with concrete conforming to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class B concrete*. Concrete shall extend form the bottom of the manhole base up to the bottom of the incoming sewer pipe, concrete shall also extend from the outside wall of the manhole out past the branch with a minimum of six inches (6”) on each side. Drop structure shall be inspected by OWNER prior to flowable fill installation. If inspection cannot be conducted, CONTRACTOR shall remove flowable fill for inspection.

3.4 TESTING

See *Section 33-05-06 - Sanitary Sewer Testing* for testing requirements.

PART 4 MEASUREMENT AND PAYMENT

A. Standard Sanitary Sewer Manholes shall be complete and in place and will be measured for each manhole 0 to 6-feet deep. Manholes deeper than 6-feet shall be measured by the number of vertical feet in excess of 6-feet.

B. Payment will be at the unit price bid and will be full compensation to complete construction. No separate payment will be made for any items of work, materials, parts, equipment, supplies or related items. Price shall include manhole ring and cover, concrete ring encasement, crushed stone, precast sections, manhole covers, precast section O-ring gaskets, lubricants, throat rings, cones, flat lids, manhole bases, pipe cradles embedment, testing, concrete, mortar, labor, tools, equipment, pipe to manhole connectors, tees, wyes, castings and all other related items required to construct, test and complete the work.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-63
SANITARY SEWER STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 31-50-00 - Trench Excavation Protection
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-01-31 - Sewer Main TV Inspection
Section 33-05-06 - Sanitary Sewer Testing
Section 33-05-07 - Jacking, Boring or Tunneling Pipe
Section 33-05-61 - Standard Sanitary Sewer Manholes
Section 33-31-00 - Sanitary Sewers
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 301 Reinforcing Steel
SAWS ITEM NO. 550 Trench Excavation Safety Protection
SAWS ITEM NO. 307 Concrete Structures

B. SCOPE:

This item shall govern for the construction of all concrete sanitary sewer structures other than standard sanitary sewer manholes. All concrete sanitary sewer structures shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, sections, and details shown on the plans or as directed by the OWNER. All plans, materials and specifications shall be in accordance with the *Texas Commission on Environmental Quality (TCEQ) Chapter 217 – Design Criteria for Domestic Wastewater Systems*.

C. SUBMITTALS:

CONTRACTOR shall submit manufacturer's product data, instructions, recommendations, shop drawings and certifications. All submittals shall be in accordance with OWNER'S requirements and submittals shall be approved by the OWNER prior to delivery.

PART 2 PRODUCTS

2.1 GENERAL

All structures shall be watertight, and the interior walls coated with a sewer structural coating on the Approved Product List. The list is located on the OWNER'S website and is periodically updated. The CONTRACTOR should review this list prior to start of construction.

2.2 CONCRETE

All concrete shall conform to the provisions of *SAWS ITEM NO. 300, Concrete (Class A)* or shall be of the class as noted on the plans. Concrete for precast structures shall have a minimum compressive strength of four-thousand (4,000) psi in twenty-eighth (28) days and comply with the applicable requirements of ASTM C 478.

2.3 REINFORCING STEEL:

All reinforcing steel shall conform to the provisions of *SAWS ITEM NO. 301 Reinforcing Steel.*

2.4 MEMBRANE CURING COMPOUND:

All membrane curing compound shall conform to the provisions of *TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."*

2.5 MANHOLE RINGS AND COVERS:

All manhole rings and covers shall conform to the provisions of *Section 330561 - Standard Sanitary Sewer Manholes.*

PART 3 EXECUTION

2.1 CONSTRUCTION METHODS:

Construction methods shall conform to all applicable terms of *SAWS ITEM NO. 307 Concrete Structures.*

Sanitary sewer structures constructed to function as manholes, wet wells, dry wells or maintenance access appurtenances to gravity sewer systems shall be constructed to accommodate influent and effluent pipes as described in applicable provisions of *Section 330561 - Standard Sanitary Sewer Manholes* and the entire completed structure tested as described therein or as approved by the OWNER. All sanitary sewer structures and manholes larger than four feet (4') in internal diameter shall conform with the minimum wall thickness, reinforcement steel, and other requirements of ASTM C 478.

All excavation and trenching shall conform to *SAWS ITEM NO. 550 Trench Excavation Safety Protection*.

2.2 TESTING:

All testing shall conform to *Section 330506 - Sanitary Sewer Testing.*

PART 4 MEASUREMENT AND PAYMENT

A. "Sanitary Sewer Structures" materials and installation will be measured in the field for each structure that is complete in place.

B. Payment will be at the unit price bid for the diameter of structure indicated and will be full compensation to complete construction. No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of the specifications for "Sanitary Sewer Structures" complete in place.

C. Payment for structures specifically identified in the project plans and specifications will be made at the unit price bid for each, which price shall include monolithic manholes, manhole ring and cover, concrete ring encasement, crushed stone, precast sections, manhole covers, precast section O-ring gaskets, lubricants, throat rings, cones, flat lids, manhole bases, pipe cradles, embedment, testing, concrete, mortar, labor, tools, equipment, pipe to manhole connectors, tees, wyes, castings, and related items required to construct, test and complete the work.

END OF SECTION

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-31-00
SANITARY SEWERS

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-01-31 - Sewer Main TV Inspection
Section 33-05-06 - Sanitary Sewer Testing
Section 33-05-07 - Jacking, Boring or Tunneling Pipe
Section 33-05-61 - Standard Sanitary Sewer Manholes
Section 33-05-63 - Sanitary Sewer Structures
SAWS ITEM NO. 550 Trench Excavation Safety Protection

B. SCOPE:

This item shall govern the furnishing and installation of sanitary sewer pipe as specified by the project plans and specifications.

All sanitary sewer mains and laterals shall be constructed in accordance with these specifications and in conformity with the required lines, grades and details shown on the plans and as directed by the OWNER.

All plans, materials and specifications shall be in accordance with the *Texas Administrative Code (TAC)* rules including *Chapter 217 Design Criteria for Domestic Wastewater Systems,* and any revisions as applicable.

C. SUBMITTALS:

Prior to the start of construction, CONTRACTOR shall submit to OWNER submittals with the type of pipe being proposed for construction for approval. Submittals shall include size, pressure class and material type, manufacturer product data and all other information required to fully evaluate pipe. CONTRACTOR shall also submit the name and qualifications of the independent testing lab that will be used for construction materials testing.

PART 2 PRODUCTS

All products shall conform to the OWNER'S Approved Products List. It is the CONTRACTOR's responsibility to request this list from the OWNER. The CONTRACTOR should review this list prior to start of construction.

2.1 CONCRETE PIPE

Concrete pipe will not be permitted for use as a sanitary sewer transmission line.

2.2 ASBESTOS-CEMENT PIPE

Asbestos-cement pipe will not be permitted for use as sanitary sewer transmission line.

2.3 POLYVINYL CHLORIDE (PVC) PIPE

A. No fillers or extenders shall be added to the PVC resin other than those ingredients normally required for lubrication, ultraviolet light protection, stabilization, resin modification and pigments essential for processing, property control or coloring. The PVC sewer pipe shall have elastomeric gasket joints conforming to ASTM D3212 and gaskets to ASTM F477.

B. All plastic pipes shall be continuously and permanently marked with the following information: manufacturer's name, pipe size (nominal), schedule size, type of material, code number and the ASTM designation with which the pipe complies.

C. Polyvinyl chloride (PVC) exposed ribbed open profile gravity sewer pipe will not be permitted for use as a sanitary sewer transmission line.

2.4 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

A. Polyvinyl chloride (PVC) pressure pipe used for force mains or other use as specified in the plans shall conform to C900 DR14 or C905 DR18 pipe with a minimum pressure class of 200 psi and 235 psi, respectively.

B. PVC pressure pipe shall be hydrostatically tested at the lowest point to a pressure equal to 2 times the sum of the design hydrostatic head of the water column plus the total friction loss with a maximum of 150 psi.

2.5 CAST IRON PIPE

Cast iron pipe will not be permitted for use as a sanitary sewer transmission line.

2.6 DUCTILE IRON PIPE AND FITTINGS

Ductile iron pipe will not be permitted for use as a sanitary sewer transmission line.

2.7 PRESTRESSED CONCRETE CYLINDER PIPE

Prestressed concrete cylinder pipe will not be permitted for use as a sanitary sewer transmission line.

2.8 FIBERGLASS REINFORCED PIPE

Fiberglass pipe may be used upon OWNER approval. See *Section 33-05-37 – Fiberglass Reinforced Polymer Mortar Gravity Sewer Pipe.*

2.9 GENERAL

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

B. All sanitary sewer pipe shall be tested by a manufacturer-approved laboratory at the source of supply. All shipments of pipe shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a Texas registered professional engineer.

PART 3 EXECUTION

3.1 GENERAL

A. All sanitary sewer mains shall 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 by the OWNER. Successful passage of the hydrostatic, mandrel and air test, as required by TCEQ shall be required for the acceptance of all mains.

B. All excavation and trenching shall conform to *Section 31-50-00 - Trench Excavation Protection*.

C. Subgrade filler: When installing pipe in unstable materials, refer to *Section 330505 - Sewer Excavation, Trenching and Backfilling*.

D. OWNER will inspect all pipe before it is placed in the trench and will reject any sections found to be damaged or defective to a degree that would affect the function of the pipe. Rejected pipe shall be immediately removed from the site of the work. The CONTRACTOR shall be required to commence construction and laying of pipe at the downstream end of the sanitary sewer outfall line and proceed in an upstream direction unless otherwise noted on the plans.

E. No pipe shall be laid within 10 feet of any point where excavation is in progress. Pipe laying shall proceed upgrade with the tongue or spigot pointing in the direction of flow. Pipe shall be lowered into the trench without disturbing the prepared foundation and trench sides. The drilling of lifting holes in the field will not be permitted.

F. Pipe shall 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 shall 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 find grade under laid joints of pipe will not be permitted. Pulling or pushing a joint of pipe in place by using a crane, bulldozer or backhoe will not be permitted.

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

H. No pipe alignment deflection shall be allowed.

I. Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight-fitting plug or closure. The interior of laid pipe shall be kept free from dirt, silt, gravel, or foreign material at all times. The interior of pipe shall be cleaned of all foreign material prior to final acceptance of the line. Stockpiled materials shall be stacked to minimize entrance of foreign matter. All pipe in place must be approved before backfilling.

J. Pipe shall be cut from measurements taken at the site and not from the plans. Necessary provisions shall be taken in laying pipe to provide for expansion and contraction.

K. The use of laser beams for vertical control shall be required. The CONTRACTOR shall retain a licensed surveyor to verify elevations of all manholes and grades of all sanitary sewer lines installed. The CONTRACTOR will make available to the OWNER, when requested, a level and rod of sufficient sensitivity to accurately determine differences in elevation between points 300 feet apart with one instrument set-up.

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

M. Inductive Tracer Detection Tape shall be placed directly above the centerline of all pipes. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations.

3.2 WASTEWATER CONNECTIONS

A. Branch connections of new main lines shall be made by use of manholes.

B. Connections made to existing mains shall be made at manholes with the crown of the inlet pipe installed at the same elevation as the crown of the existing pipe.

C. When connections to existing mains are made, a temporary plug approved by the OWNER must be installed downstream in the manhole to prevent water and debris from entering the existing system before Field Acceptance. These plugs shall be removed after the castings are adjusted to finish grade or prior to Field Acceptance.

D. Where a service connection to a main is made, a wye, tee or double wye shall be installed.

E. Where not otherwise indicated, wastewater service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

F. Sanitary sewer cleanouts shall not be installed in driveways. If unable to install outside of driveway limits, the CONTRACTOR shall submit a variance request to OWNER.

G. Cleanouts shall be covered and protected to eliminate debris from entering the sanitary sewer system.

3.3 SEPERATION DISTANCES

A. All sewer main construction will conform to the Separation Distance requirements of the *TCEQ Chapter 217 Design Criteria for Domestic Wastewater Systems.*

B. At all waterline and stormwater crossings and where water and sewer mains are parallel and separation distance cannot be achieved as per TCEQ Chapter 217.53, use extra stiff pipe SDR 26 PVC (ASTM D2241) with a minimum pressure rating of 160 psi. Pipe shall be encased in grout 6" minimum thickness and 10' beyond both sides of crossing.

C. When the depth of cover over the top of the pipe is 0 – 14 feet, polyvinyl chloride (PVC) sewer pipe and fittings shall conform to ASTM D3034 SDR 26 (6" – 15") or ASTM F679 PS 115 (18" – 27") with a minimum stiffness of 115 psi.

D. When the depth of cover over the top of the pipe is greater than 14 feet, pipe shall have a minimum pressure class of 160 psi.

3.4 TRAPS AND INTERCEPTORS

A. Traps and interceptors must be included in design plans and in accordance with current plumbing code.

B. Traps and interceptors shall be inspected by the local City government.

C. SARA requires a 6-inch or larger sample well and will perform hydrostatic testing for all traps and interceptors.

3.5 QUALITY CONTROL

A. Pipes and manholes shall be tested in accordance with *Section 33-05-06 - Sanitary Sewer Testing*.

B. All pipes shall be televised in accordance with *Section 33-01-31 - Sewer Main TV Inspection*.

C. No pipe installation will be accepted until all known leaks have been identified and repaired, regardless if leakage is within the allowable limits. Locating and repairing of leaks shall be performed by the CONTRACTOR at no additional cost.

D. The INSPECTOR will certify that all required pressure and leakage tests have been successfully completed before the pipe is accepted. The INSPECTOR'S records will include the rate of leakage of all final leakage tests. Passage of a test does not relieve the CONTRACTOR of his responsibilities to meet the requirements of the specifications.

E. CONTRACTOR shall submit record drawings on a flash drive at the end of the project. CONTRACTOR shall also submit CCTV on a flash drive and compaction density reports for the sewer line and all service laterals. Warranty letters on materials and workmanship shall be for 24 months after final acceptance.

F. Deflection tests shall be performed on all flexible pipe in accordance with *TCEQ Chapter 217 - Design Criteria for Domestic Wastewater Systems*.

G. Pipe wall thickness and outside diameter shall meet the requirements established in the respective ASTM standards.

I. Pipe wall thickness and outside diameter for AWWA-C905 pipe shall meet the requirements established by the AWWA-C905 standard.

PART 4 MEASUREMENT AND PAYMENT

Sanitary sewer construction pipe length will be measured from edge of manhole to edge of manhole. The sanitary sewer line item will be paid for at the contract bid price per linear foot complete in place for the size of line to be constructed. Said price shall be full compensation for furnishing all materials, trenching, bedding, backfill, pumping, haunching, concrete plugs, seepage retainage, laying and jointing, tamping, water, vertical stacks, air testing, line cleaning, television inspection, labor, tools equipment and other incidentals necessary to complete the work. Full payment shall not be issued until all testing requirements are satisfied and result in passing.

END OF SECTION