**San Antonio Water System Standard Specifications for Construction**

**ITEM NO. 852**  
Sanitary Sewer Manholes

**852.1 DESCRIPTION:** This item shall govern the construction of standard sanitary sewer manholes complete in place and the materials therein, including manhole rings and covers. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ § 217) and Chapter 213 Edwards Aquifer Recharge Zone, or any revision thereto as applicable.

**852.2 REFERENCED STANDARDS:** Reference standards cited in this Specification Item No. 852 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 852, unless a date is specifically cited:

1. **San Antonio Water System (SAWS):**  
   a. Specifications for Water and Sanitary Sewer Construction  
   b. SAWS Materials Specifications

2. **City of San Antonio (COSA) Specifications for Construction**

3. **Texas Commission of Environmental Quality (TCEQ)**  
   a. Chapter 217 Design Criteria for Domestic Wastewater Systems  
   b. Chapter 213 (“Edwards Aquifer”)  

4. **AASHTO – American Association of State Highway and Transportation Officials:**  

5. **ASTM – American Society for Testing and Materials:**  
   a. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile  
   c. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement  
   e. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections  
   f. ASTM C 890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures  
   g. ASTM C 913 – Standard Specifications for Precast Concrete Water and Wastewater Structures.  
   h. ASTM C 990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants  
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k  ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft.)


q  ASTM D 2996 - Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

r.  ASTM D 2997 - Standard Specification for Centrifugally Cast “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe

6.  American Society of Mechanical Engineers

   a.  ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings

852.3 SUBMITTALS: Contractor shall submit manufacturer’s product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer’s requirements, and submittals shall be approved by the Engineer prior to delivery.

1.  Submit proposed methods, equipment, materials and sequence of operations for sewer construction.

2.  Plan operations so as to minimize disruption of utilities to occupied facilities or adjacent property.

3.  Submit test reports

4.  Submit pre and post construction videos. Videos become property of SAWS.

852.4 MATERIALS: All constructed manholes shall be watertight and equipped with pre-tested and approved ring and covers. Sewer manhole ring and cover castings shall meet the current requirements of the American Association of State Highway and Transportation Officials (AASHTO) Designation M306-10.

1.  Concrete Manhole Components: For new concrete manholes, all concrete manhole components (cast-in-place or precast manhole base, precast risers, precast cone sections, cast-in-place or precast flat tops, and as applicable) for new manholes shall conform to the applicable requirements of ASTM Designation C478, except as modified below.

   a.  Concrete Grout: All concrete grout used for patching or other similar fill-in work shall be of non-shrink type made with the Komponent® admixture specified above, or approved alternate, in accordance with the
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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°F baseline temperature.

2. The manhole ring and cover shall be of ductile iron or gray cast iron construction. The cover shall be solid with no vent or pick holes; hinged with underlying special hinge area leakage protection; the cover secured with four (4) stainless steel bolts; and shall have a recessed “pick bar” for cover opening. Cam lock type covers shall not be allowed.
   a. Approved manufacturers, as listed in the SAWS Approved Products List (APL), have previously completed required inflow leakage shop testing and have met a maximum allowable leakage rate criterion of 1 gallon per minute (gpm) at 12 inches of water submergence above the manhole cover.
   b. Nominal cover diameter shall be 32 inches, with 30 inch clear opening, as required by TCEQ.
   c. 24-inch covers to be utilized on existing manholes with 24 covers only.
   d. Vented Manhole Covers will be specified by SAWS Engineer.

3. “Throat rings” shall be made of HDPE and have a maximum thickness of 2 inches. No concrete throat rings shall be used.
   a. The internal diameter shall match that of the ring and cover’s opening. "HDPE “throat rings” are to be used in conjunction with a UV stabilized internal polyethylene liner for the purpose of providing an infiltration/inflow (I/I) barrier.
   b. The I/I Barrier shall be as manufactured by Strike Tool Products of Cannon Falls, MN. See SAWS APL.
   c. Note of Clarification: A minimum of two and a maximum of six “throat rings” may be used at each adjusted manhole. “Throat rings” are limited to a minimum of two and a maximum of four rings for new manhole construction. Throat rings shall be a maximum thickness of two (2) inches.

4. Bitumastic Joint Sealant. Flat tops, and between the ductile or gray cast iron ring (frame) and the uppermost adjustment ring or flat top: See Approved APL.

5. Interior Coating: The interior of all rehabilitated manholes shall be rendered watertight, chemically resistant, and abrasion resistant through the use of a SAWS approved sewer coating. See SAWS APL.
   a. Prior to coating, all manholes shall be hydrostatic test and/or vacuum tested, and approved by Inspector or Engineer.
   b. Contractor shall follow manufacturer’s recommendations in manhole preparation and product application to ensure that coating systems properly adhered to manhole walls and to prevent moisture from entering behind coating.
   c. Coating shall be applied to the interior of the manhole to the top of the cone section and extend 6-inches down the exterior side of the cone section. See Drawing DD-852 drawing series.
   d. Note of Clarification: Existing manholes being adjusted only as per

852 sanitary sewer manhole.docx

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Specification Item 851 will not require a coating system.

6. For rehabilitated manholes; first, apply a combination of cementitious coatings followed by an approved epoxy coating. Kerneos SewperCoat 2000 HS and PG and APM Permacast MS-10,000 with ConShield, applied at the required one inch thick application, is the only product approved which does not require a subsequent epoxy coating.

7. Other approved materials are located on SAWS website under SAWS Approved Products List. The list is periodically updated and should be checked by Contractor prior to start of construction.

8. For reconstructed manholes; first, apply a combination of cementitious coatings followed by an approved epoxy coating with the cementitious coating first. Kerneos SewperCoat 2000 HS and PG and APM Permacast MS-10,000 with ConShield, applied at the required one inch thick application, is the only product approved which does not require a subsequent epoxy coating.

9. Other approved materials are located on SAWS website under SAWS Approved Products List. The list is periodically updated and should be checked by Contractor prior to start of construction.

10. New Manholes shall be precast manholes and shall have an antimicrobial additive introduced to the concrete mix in order to provide protection against Microbial Induced Corrosion (MIC).
   a. The liquid antimicrobial additive shall be an EPA registered material and the registration number shall be submitted for approval prior to use in the project.
   b. Manufacturer shall also provide a State of Texas registration for the antimicrobial.
   c. Manufacturer shall be approved by SAWS Products Standard Committee and be on the APL
   d. The antibacterial additive shall be used to render the concrete uninhabitable for acid producing bacterial growth.
   e. The antimicrobial shall only be used by precast producers that have been certified by the manufacturer of the antimicrobial additive.
   f. Dosage of the antimicrobial shall be per manufacturer’s recommendations.
   g. A ferrous oxide tinting agent shall be used to identify all antimicrobial concrete precast, and shall be dosed per manufacturer’s recommendations producing a terracotta tint to the cured concrete.

852.5 CONSTRUCTION:

1. Manholes shall be constructed of materials and workmanship as described by these specifications, at such places shown in the contract documents or as designated by the Engineer, and in conformity with the typical details and sketches shown.

2. Unless otherwise shown in the contract documents or approved by the Engineer, standard sanitary sewer manholes shall be constructed with influent and effluent piping less than or equal to 24 inches in diameter with precast reinforced concrete manhole sections.
3. A standard sanitary sewer manhole shall be a single entrance cylindrical structure, having a minimum internal diameter of 4 feet between the cone and base sections.
4. The base of the structure shall include the load bearing portion beneath and exterior of the structure, invert channels and the fill or bench portions adjacent to the lower sewer pipes within the structure.
5. The maximum vertical height of the diameter adjustment section or cone shall be 36 inches.
   a. Adjustment of throat rings may be used for final elevation adjustment of the manhole ring and cover.
   b. Concrete encasement of the manhole’s ring shall be as shown in the DD-852 Standard Drawing Series.
   c. Ring and cover shall be attached to the diameter adjustment flat top section or cone.
   d. Manholes which differ from the above description shall be governed by Specification Item No. 850, "Sanitary Sewer Structures."
6. An internal drop manhole shall be required, when sewer lines enter a manhole more than 24 inches above the manhole invert.
7. An external drop manhole shall be provided for a sewer entering a manhole more than 30 inches above the invert.
8. Internal drop manholes will require prior approval by the SAWS Engineering Director.
9. Footings or bases of manholes shall be a minimum of 6 inches in depth below the bottom of the pipe.
10. All invert channels shall be constructed and shaped accurately so as to be smooth, uniform and cause minimum resistance to flow.
11. The bench shall be finished smooth with a slope of ½ inch per foot from the manhole walls to the edges of the invert.
12. The top half of all sewer pipes within the invert channel or bench zone shall be removed flush to the inside manhole walls.
13. Joints on sewer pipes shall not be cast or constructed within the wall sections of manholes.
14. Concrete cradles shall be required for new pre-cast manholes.
15. Concrete cradles shall extend beyond the outside walls of the manhole a minimum of 36 inches.
16. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, as specified above, or as approved by the Engineer, or as shown in the contract documents and inspected prior to backfilling.
17. Where connections to existing manholes are required, the adjacent pipe bedding shall be prepared to proper grade, the existing manhole neatly cored and the new pipe inserted so that the end is projecting 2 inches from the inside wall.
18. The invert shall then be reshaped to properly channel new flows.
19. Debris of any kind shall be kept out of new or existing manholes or mains.
20. Joints between cones, risers, adjustment rings, flat tops, and between the ductile
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cast iron ring and the uppermost adjustment ring or flat top, as applicable, shall be thoroughly sealed in accordance with manufacturer’s recommendations with adhesive bitumastic products as specified above.

21. Where precast concrete risers are used, any gaps in the outer joint surfaces shall be additionally coated with non-shrink grout to a minimum thickness of ¼ inch.

22. All manhole rings shall be encased with 4,000 psi reinforced concrete as shown in the contract documents or as approved by the Engineer.
   a. Concrete manhole ring encasement shall extend 6 inches below the top of the cone and have a minimum width when measured at the manhole ring of 1 foot. The surface of the encasement shall be flush with the top of the manhole ring.

23. All new manholes shall be encased with a minimum of 12 inches thickness of flowable fill to one foot above the cone section. See DD-852 drawing series.

852.6 TESTING: The Contractor shall notify Inspector and Engineer 48 hours prior to beginning of manhole testing and only after a successful pretest has been performed.

1. Contractor is to be prepared to test if coordinated with Inspector. Fines maybe assessed if Contractor cancels or delays testing.

2. The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following:

3. All manholes must pass a leakage test.

4. The contractor shall test each manhole (after assembly and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer.

5. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:
   a. Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water.
      (1) Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses.
      (2) At the conclusion of the 24-hour saturation period, the manhole shall be filled to the top and observed.
      (3) Any measurable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed.
      (4) All effort, materials, or other costs shall be solely at the Contractor’s expense.
   b. Vacuum Testing: Manholes shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place.
      (1) Drop-connections and gas sealing connections shall be installed prior to testing.
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2. The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole.

3. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc.

4. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole.

5. Only a cementitious coating maybe applied.

6. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole.

7. The test head shall be inflated in accordance with the manufacturer's recommendations.

8. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off.

9. With the valve closed, the level vacuum shall be read after the required test time.

10. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test.

11. The required test time is 2 minutes.

c. Acceptance: Any manhole which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the manhole is constructed.

d. The manhole shall be retested as described above until a successful test is attained.

e. After a successful test, the temporary plugs will be removed.

f. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.

1. Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic/vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired.

g. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed.

h. The manhole shall then be retested and coated with a SAWS- approved sewer coating as stated above.

i. The Owner may elect to simply remove and replace the existing manhole with a new one.

j. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot above the top of the cone.

1. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment.
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k. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method.

l. After abrading and cleaning, additional protective coating material shall be applied to the repair area.

m. All touch-up repair procedures shall follow the protective coating manufacturer’s recommendations.

5. If a sanitary manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer’s recommendations and re-tested.

6. It shall not be accepted until it passes all tests.

7. All repairs and re-testing and replacement shall be at no additional cost to SAWS.

852.7 MEASUREMENT: Sanitary sewer manholes (0 to 6 feet deep) as designated in the contract documents shall be measured as the total number of such manholes constructed, including those exceeding 6 feet in depth from the lowest invert elevation to the top of the ring.

1. Manholes deeper than 6 feet shall be measured by the number of vertical feet in excess of 6 feet.

852.8 PAYMENT:

1. Sanitary sewer manholes shall be paid at the contract unit price bid for each such manhole at the following milestones:

   a. Milestone 1: Manhole setting to include for each such manhole, which price shall be full compensation for setting manhole base setting to include concrete base encasement with steel reinforcements as described in this specification. After curing of concrete manhole flowline elevation shall be verified and approved by engineer of record prior to payment.

   b. Milestone 2: Manhole riser installation: All manhole risers and cone sections shall be paid at the contract unit price bid for each such manhole riser, which price shall be full compensation for all remaining sections, flowable fill (up to 1 foot above the bottom of the cone section), drop pipes, saw cutting of surfaces as required, reinforced concrete, diversion of flow, fittings, labor, tools, equipment, tees, wyes, and incidentals trench protection, special shoring and disposal of material excavated, and for furnishing and placing all materials, all testing, necessary to complete the work prior to payment.

   c. Milestone 3: Sanitary Sewer Manhole Encasement and Testing: This pay item includes manhole concrete encasement and rebar, HDPE throat rings, UV stabilized polyethylene liner I/I barrier, ring and cover.

2. Extra depth manholes shall be paid for at the contract unit price bid per vertical foot as measured above.

3. Concrete cradles for pipes shall be measured and paid for at the contract unit price bid as provided for in Specification Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."

4. Gravel subgrade filler for manholes shall not be measured separately for payment.

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End of Specification
Precast Reinforced Concrete Manhole Sections
ASTM Designation C-476
4000 psi min. Strength in 28 Days

Secondary Backfill

Backfill Around Manhole Shall be Flowable Fill Up to
1 Foot Above Cone Section.
(See General Notes)

Flowable Fill (Amount will Vary per Project) 12" Min.
Around the Manhole

Note "A" Sewer Pipe Connecting to Manholes Above the Lowest
Sewer Shall Protrude 2" from the inciso Wall and be Installed
with a Joint Located a Minimum 24 Inches

PRECAST MANHOLE

Concrete Cradle to Nearest Point of all Lines Leaving or
Entering Manholes
All Pipe is Used, Provide Rubber Gasket One Size Smaller
than Pipe at Each Wall Crossing of Manhole, If HDPE Pipe is Used
a Non-Shrink Grout to be Applied within the Wall Sections, Gasket
is also, Required.

No Joints for Pipe will be
Allowed within Wall Section

General Notes:
1. Material for Sanitary Sewer Pipe must be the Same from Manhole
to Manhole. Changes in Type of Pipe may be Made Only at Manholes,
or Special Structures, except as Approved by the SAWS Inspector.
2. Adapters and Concrete Collars shall be Used as Directed and Approved
by the SAWS Inspector.
3. Watertight Manhole Rings and Covers shall be Trans-Tex A77 "O" Ring
or Approved Equal.
4. The Minimum Angle of Flow for a Connecting Sewer to the Direction of
Flow Defined by a Collection System is 90 Degrees, unless Approved
by the Engineer.
General Notes:

1. Material for Sanitary Sewer Pipe Must be the Same from Manhole to Manhole. Changes in Type of Pipe May be Made only at Manholes, or Special Structures, Except as Approved by the Project Engineer.
2. Adaptors and Concrete Collars shall be used as approved by the SAWS Project Engineer.
3. Watertight Manhole Rings and Covers shall be Trans-Tex A77 “O” Ring or Approved Equal.

Backfill Around Manhole Shall be Flowable Fill Up to 1 Foot Above Cone Section. (See General Notes)

Press Seal Gasket Install with Power Sleeve Expansion ASTM C-923 at Base Section PreCast

Concrete Grout

#4 Bars @ 12” O.C. Each Way

MONOLITHIC MANHOLE
NOTE:
1. The Concrete Shall be 4000 PSI Minimum and Reinforced with No. 4 Bars as Shown.
2. The Concrete Shall Extend to Edge of Saw Cut Pavement.
3. Manhole Ring Encasement is Required on all Manholes.
4. Manhole Lid shall Open in the Direction of Traffic or Downstream in Parkway.
NCTE:
1. The Concrete Shall be 4000 PSI. Minimum and Reinforced with 2 - #4 Bars as Shown.
2. The Concrete Shall Extend to Edge of Saw Cut Pavement.
3. Manhole Ring Encasement is Required on all Manholes.
4. Manhole Lid Shall Open in the Direction of Traffic or Downstream in Parkway.
Press Seal Gasket
Install with Power Sleeve
Expansion ASTM 923

Pipe "IN"
FLOW

Flowable Fill
Minimum 12”
Thick

Press Seal Gasket
Install with Power Sleeve
Expansion ASTM 923

Pipe "CUT"
FLOW

PLAN

Flowable Fill

12”
6”
4'-0"
6”

5'-0”
2'-0”

SECTION A-A
(4) 1" Dia. Anchor Bolt Holes
Equally Spaced on 36\(\frac{3}{8}\)" Dia. Bolt Circle

4X Drill Tap & Cbore
\(\frac{1}{2}-13 \times 2\frac{1}{8}\)" Long
SS Hex Head Bolt
Narrow Washer
Kit #91562
Optional Penta HD Bolt Available

Type "C" Lid Design
w/Permagrip Texture

(1) Pickmattock

2" Raised Letters
Flush w/Top Surface

Custom Logo

\(\frac{3}{8}\)" Hole
(3 Places)

SECTION A - A

Hold Open Device

FRAME SHOWING HINGE PLUG

Neoprene Plug
(For Self-Sealing)

SECTION B - B

"T" SEAL GASKET DETAIL
NOTE: Price for Drop Fittings and Encasement to be included with the Price of Manhole.

If PVC Pipe is Used, Provide Rubber Gasket One Size Smaller than Pipe at Each Wall Crossing of Manhole. If HDPE Pipe is Used a Non-Shrink Grout to be Applied within the Wall Sections.
Final Grade

Secondary Backfill

Backfill around Manhole Shall be Flowable Fill up to 12-Inches Above Cone Section.

Inside Drop Bowl Secure with Stainless Steel Fasteners

Rubber Boot Conc. Encase @ Boot

Inlet Sewer line

Stainless Steel Straps Secured to Structure with 2 Stainless Bolts Strap at 4' Intervals (Min. 2 Straps)

External Pipe Coupler

PVC Drop Pipe

Flowable Fill (Amount will Vary per Project) 12" Min.

1/2" Per Ft

Optional Drop End

NOTE:
THIS MANHOLE IS TO BE APPROVED BY SAWS DIRECTOR OF ENGINEERING PRIOR TO CONSTRUCTION.
Marhole Ring and Cover Per DD 852-07
Final Grace

Reinforced Concrete with No. 4 Bars at 12" E.W.

6" Min. Opening

Fiberglass Manhole Per ASTM D-3753 Specifications
- Commercial Grade Polyester
- Type "E" Fiberglass
- Silane Treated Silica Sand
FRP Coupling or Approved Equal**
Connection per SAWS Specification Item No. 853

Concrete Encasement for Drop Manhole Only (N.S.P.I.)*
Fiberglass Bottom with 3" Anti Flotation Flange
Concrete Encasement (Non-Reinforced) (N.S.P.I.)*

Reinforced Concrete Encasement W/ #5 Bar's @ 12" O.C.E.W. (Not Shown) (N.S.P.I.)*
Fiberglass Sewer Pipe

Notes:
1. Encasement to be Designed to Resist all Tee Base Deformations and is to Extend Past the First Joint on Either Side of the Tee Base by 1' to 3'
2. All Concrete Encasement Required for Tee Base Manholes Shall be Considered Incidental to the Cost of the Manholes.
3. Backfill Around Manhole Shall be Flowable (low Strength) with a Min. Thickness of 12-Inches and Fill Shall be Placed within 12-Inches of Final Grade. This Cost Shall be Incidental to the Cost of the Manhole.
4. Over Excavation within Areas for Placement of Sanitary Sewer Manholes and Structures Shall be Backfilled Per Detail This Sheet with Regards to Flowable Fill and ASTM D448 Aggregate. This Cost Shall be Incidental to the Cost of the Manhole or Structure.

Fiberglass (FRP) Sewer Pipe Meeting The Requirements of ASTM D743 for Direct Bury Installation
Fiberglass (FRP) Pipe Joints Using Flexible Elastomeric Seals Meeting The Requirements of ASTM D4151

8" Min.

Grount Annula Space

8" Min.

1'4" Min. (Typ.)

48" Fiberglass Riser

6" Min.

#5 @ 12" O.C.

#5 Diagonal Bars @ 12" O.C. All Around

#5 @ 12" All Around

12" Min.

TEE BASE CONCRETE REINFORCEMENT SECTION THROUGH PIPE
**SECTION VIEW**

Notes:

1. Encasement to be Designed to Resist all Tee Base Deformations and is to Extend Past the First Joint on Either Side of the Tee Base by 1' to 3'
2. All Concrete Encasement Required for Tee Base Manholes Shall be Considered Incidental to the Cost of the Manholes.
3. Backfill Around Manhole Shall be Flowable with a Min. Thickness of 12-Inches and Fill Shall be Placed to within 12-Inches of Final Grade. This Cost Shall be Incidental to the Cost of the Manhole.
4. Over Excavation within Areas for Placement of Sanitary Sewer Manholes and Structures Shall be Backfilled Per Detail This Sheet with Regards to Flowable Fill and ASTM D448 Aggregate. This Cost Shall be Subsidary to the Cost of the Manhole or Structure.

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**PLAN VIEW**

- Reinforced Concrete Encasement W/#5 Bars @ 12" O.C.E.W. (Note Shown) (N.S.P.I.)
- Fiberglass* Sewer Pipe
- Standard Ring and Cover
- 8" Min.

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**PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS**

| TEE - BASE FIBERGLASS MANHOLE |
|-------------------------------|---|---|
| **APPROVED** | **REVISED** |
| AUG 2019 | |

**DD-852-11**

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* Fiberglass (FRP) Sewer Pipe Meeting The Requirements of ASTM D3743 for Direct Bury Installation
** Fiberglass (FRP) Pipe Joints Using Flexible Elastomeric Seals Meeting The Requirements of ASTM D4151
**SECTION VIEW**

Notes:
1. Encasement to be Designed to Resist all Tee Base Deformations and is to Extend Past the First Joint on Either Side of the Tee Base by 1' to 3'
2. All Concrete Encasement Required for Tee Base Manholes Shall be Considered Incidental to the Cost of the Manholes.
3. Backfill Around Manhole Shall be Flowable with a Min. Thickness of 12-Inches and Fill Shall be Placed to within 12-Inches of Final Grade. This Cost Shall be Incidental to the Cost of the Manhole.
4. Over Excavation within Areas for Placement of Sanitary Sewer Manholes and Structures Shall be Back filled Per Detail This Sheet with Regards to Flowable Fill and ASTM D448 Aggregate. This Cost Shall be Subsidiary to the Cost of the Manhole or Structure.

**PLAN VIEW**

- Fiberglass Sewer Pipe
- Fiberglass Coupling
- Fiberglass Tee-Base
- Angle as Required on Plan Sheet
- Standard Ring and Cover
- 8" Min.
- Reinforced Concrete Encasement W/ #5 Bars 12" O.C.E.W. (Note Shown) (N.S.P.I.)
- Fiberglass Sewer Pipe
- Fiberglass** Coupling
- Fiberglass* Covering
- Fiberglass* Coupling
- Fiberglass* Sewer Pipe
- Fiberglass Bottom with 3" Anti Flostation Flange
- Concrete Encasement (Non-Reinforced) (N.S.P.I.)*
- Reinforced Concrete Encasement W/ #5 Bars @ 12" O.C.E.W. (Not Shown) (N.S.P.I.)*
- Grout Annular Space
- Minimum Wall Thickness 0.50 Thickness (½ Nom.)
- Varieties
- Reinforced Concrete with No. 4 Bars at 12" E.W.
- 30" Min. Opening
- Final Grade
- Manhole Ring and Cover Per DD 852-07

**Fiberglass (FRP) Sewer Pipe Meeting The Requirements of ASTM D3743 for Direct Bury Installation**

**Fiberglass (FRP) Pipe Joints Using Flexible Elastomeric Seals Meeting The Requirements of ASTM D4151**
Notes:
1. Encasement to be Designed to Resist all Tee Base Deformations and is to Extend Past the First Joint on Either Side of the Tee Base by 1' to 3'

2. All Concrete Encasement Required for Tee Base Manholes Shall be Considered Incidental to the Cost of the Manholes.

3. Backfill Around Manhole Shall be Flowable (low Streneght) with a Min. Thickness of 12-Inches and Fill Shall be Placed to within 12-Inches of Final Grade. This Cost Shall be Incidental to the Cost of the Manhole.

4. Over Excavation within Areas for Placement of Sanitary Sewer Manholes and Structures Shall be Backfilled Per Detail This Sheet with Regards to Flowable Fill and ASTM D448 Aggregate. This Cost Shall be Incidental to the Cost of the Manhole or Structure.

* Fiberglass (FRP) Sewer Pipe Meeting The Requirements of ASTM D3743 for Direct Bury Installation

** Fiberglass (FRP) Pipe Joints Using Flexible Elastomeric Seals Meeting The Requirements of ASTM D4151