

# 33 3113 – SANITARY SEWER

## SANITARY SEWER

### PART 1 – GENERAL

#### 1.01 Section Summary

- A. This Section includes sanitary sewer pipe, manholes, and appurtenances.

#### 1.02 Related Sections

- A. Section 1700 – Adjustment of Structures
- B. Section 2000 – Trench Excavation and Backfill

#### 1.03 References

- A. American Society of Testing and Materials (ASTM)
  - 1. A48 – Specification for Gray Iron Castings.
  - 2. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete.
  - 3. C139 – Specification for Concrete Masonry Units for Construction of Batch Basins and Manholes.
  - 4. C150 – Specification for Portland Cement.
  - 5. C206 – Specification for Finishing Hydrated Lime.
  - 6. C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
  - 7. C478 – Specification for Precast Reinforced Concrete Manhole Sections.
  - 8. D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
  - 9. D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds.
  - 10. D1785 – Specification for PVC Plastic Pipe, Sch. 40, 80, and 120.
  - 11. D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity – Flow Applications.
  - 12. D3034 – Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

13. D3212 – Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
  14. F477 – Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  15. F679 – Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
  16. F794 – Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
  17. F1417 – Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
- B. American Water Works Association (AWWA)
1. C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  2. C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water.

1.04 Submittals

- A. Submit all shop drawings and manufacturers information prior to construction.

PART 2 – PRODUCTS

2.01 Concrete and Mortar

- A. All concrete products shall use Type 1 Portland Cement (conform to ASTM C150), washed sand, and crushed aggregate free of deleterious materials.
- B. Mix designs shall be approved by the Engineer and must obtain 4000 psi compressive strength at 28 days.
- C. Use non-shrink mortar for brick work and sealing of structures. Use one part cement to 2 parts sand.

2.02 Manholes

- A. Manhole sections shall be precast and shall conform to ASTM C478.
- B. Joints: Shall be rubber o-ring gasket type.
- C. Bases:
  1. Shall be pre-cast and integral with bottom section of manhole.
  2. Invert shall be pre-cast and shall be graded to provide flow through the structure.
  3. Dead end manholes shall have the invert continue to the opposite side of the manhole.

- D. Outside Drops: Shall have upper and lower rubber boot connections. The drop pipe shall be supported by concrete horseshoes. All voids shall be filled with concrete. All drop manholes shall be PVC lined according to manufacturers recommendations with Ameron T-Lock, or approved equal.
- E. Manhole Steps: Shall be steel reinforced polypropylene steps. Steps shall be installed on the downstream side of the manhole.
- F. Pipe Connections: Manholes shall be cast with the appropriate size openings for the size of pipe shown on the plans. A rubber boot with a stainless steel band shall be installed with the fabrication on all new manholes.
- G. Manhole Castings:
  - 1. Neenah R-1642 lid type B or approved equal.
  - 2. Machine cover and frame contact surface for non-rocking protection.
  - 3. Include 2 concealed pick holes, Type F.
  - 4. Shall be stamped "SANITARY SEWER" on the lid.

2.03 Polyvinyl Chloride (PVC) Sewer Main Pipe

- A. All PVC sewer main pipe and fittings shall conform to:
  - 1. ASTM D3034 for sizes 4 – 15 inch and ASTM F679 for sizes 18 – 24 inch unless the Engineer requires a higher standard. B. All pipes shall be bell and spigot.
- A. All pipe joints shall be push-on type and shall conform to ASTM D3212. All pipe shall have Elastomeric Seal (Gasket), polymer based synthetic rubber conforming to ASTM F477 which shall be bonded to the inner walls of the gasket recess of the bell socket. Natural rubber gaskets are not allowed.
- B. Each pipe shall be identified by name of manufacturer, nominal pipe size, and PVC cell classification.
- C. Minimum pipe size shall be 8 inch for sewer mains.
- D. For depths less than 20 feet, all pipe shall be a minimum of SDR-35. For pipes deeper than 20 feet, pipe shall be a minimum of SDR-26.
- E. For pipes larger than 15 inch, pipes shall conform to ASTM F679 with a minimum wall thickness for a minimum pipe stiffness of 46.
- F. PVC shall be used for all sewer main pipe unless conditions or design constraints warrant the use of another material and as approved by the City Engineer.

2.04 Ductile Iron (DIP) Sewer Main Pipe

- A. All DIP sewer main pipe and fittings shall conform to AWWA C151.
- B. Joints shall be mechanical or push-on type and conform to AWWA C111.
- C. All DIP shall have a protective interior lining and shall be PROTECTO 401 Ceramic Epoxy, or equal, and shall be 40 mil thick. The pipe must be marked stating the lining product used and the date applied.
- D. All DIP shall be encased in polyethylene pipe encasement.

2.05 Marking Tape

- A. Tape shall be 3 inch width, non-detectable type.
- B. Tape shall be green with black lettering with words "CAUTION SEWER LINE BELOW".

2.06 Manhole Chimney Seals

- A. Internal Chimney Seals, Cretex Specialty Products or approved equal.
  - 1. The sleeve and extensions shall have a minimum thickness of 3/16 inches and shall be made from a high quality rubber compound conforming to the applicable material requirements of ASTM C-923, with a minimum 1500 psi tensile strength, a maximum 18% compression set and hardness (durometer) of 48+5.
  - 2. The expansion bands shall be integrally formed from 16 gauge stainless steel conforming to the applicable material requirements of ASTM C-923, Type 304, with no welded attachments. The expansion bands shall have a minimum adjustment range of 2-1/2 diameter inches and a positive locking mechanism which secures the band in its expanded position after tightening.
- B. External Chimney Seals, Cretex X-Lite External Seal or approved equal.
  - 1. The frame seal shall remain flexible allowing for repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than 1/2 inch. The sleeve portion of the seal shall have a nominal vertical height of 7 inches, 11 inches, 16 inches or 20 inches. The sleeve shall have a minimum thickness of 60 mils and shall be made from a high-quality EPDM rubber suitable for both above and below grade applications. A full circumferential butyl rubber strip conforming to ASHTO M-198 shall be positioned and attached 1/4 inch from the bottom inside edge of the sleeve. The butyl rubber strip shall be 1-1/2 inch wide by 1/4 inch thick. A form fitted flange gasket shall be used on the base flange of the manhole frame casting and shall be EPDM rubber with a hardness (durometer) of 40±5. The top compression band shall be "C" shaped to uniformly compress the flange gasket and mechanically lock the seal onto the base flange of the manhole frame casting.

Both the top and bottom compression bands shall have a take-up mechanism capable of developing a minimum of 400 lbs. of torque.

2.07 Sanitary Sewer Forcemain

- A. Pipe shall be manufactured in accordance with the latest revision of AWWA C900 or be rated for a pressure at least twice what the operating pressure of the pipe will be.

PART 3 – EXECUTION

3.01 General

- A. All trenching activities shall conform to Section 2000 – Trench Excavation and Backfill.
- B. By Pass Pumping: When required, the Contractor shall be responsible for notification of existing sewer system users if service will be interrupted. The Contractor shall also install the system to maintain sewer flows during construction. Unless otherwise specified, the costs for all by pass pumping shall be incidental to the Project.

3.02 Installation of Pipe and Fittings

A. Connect to Existing System

1. Connections to existing manholes shall be made with a water tight boot with a stainless steel band.
2. All new manhole connections where a new hole must be made shall be made by coring the manhole and installing a new boot with stainless steel band.
3. Reconstruct manhole invert to allow for flow through the manhole.

B. Pipe Installation

1. Pipe shall be laid to the line and grade as shown on the Plan and/or staked in the field. No deviation is allowed unless directed by the Engineer. Deviation shall be cause for removal and relaying pipe at the Contractor's expense.
2. Lay pipe upgrade with spigot end in the direction of flow. Lubricate all joints and push pipes home. Ensure pipe is to line and grade before bedding and backfilling.
3. Contractor shall protect pipe during construction at all times. Any material that enters the pipe shall be removed. All pipes shall be clean before being put in service.

3.03 Manholes

- A. Shall be installed level. No deviation is allowed.
- B. Precast integral base shall be placed on compacted granular bedding.
- C. Install short precast manhole section (maximum of 16 inch height) below the eccentric cone or precast top slab.

- D. Vertical wall of the eccentric cone section shall be on the downstream side.
- E. Steps shall be placed over the downstream pipe. When pipe size is in excess of 24 inches, place steps where most appropriate for access.
- F. Install rings and casting in conformance to Section 1700 – Adjustment of Structures. A minimum of 2 rings must be installed.
- G. All pipe connections must be neatly sealed with mortar.
- H. All lift holes must be mortared.

3.04 Service Connections

- A. Wye to be installed at a 45 degree angle to the horizontal.
- B. Risers shall be supported at the wye with concrete and shall be supported on undisturbed trench slope for the entire length.

3.05 Insulation

- A. Insulation shall be installed when sanitary sewer comes within 2.5 feet of storm sewer or when the pipe comes within 5 feet of the surface.

3.06 Bulkhead and Abandon Existing Lines

- A. Existing pipes and openings in manholes shall be sealed using mortar to obtain a water tight seal.
- B. Abandoned lines shall be filled with silica sand or flowable fill to completely fill the line to prevent collapse and groundwater infiltration.
- C. Before lines are abandoned, live services must be connected and in service to new sewer main.

3.07 Internal Chimney Seals, Cretex Specialty Products or approved equal.

- A. Apply internal chimney seal only after adjustment to finished grade is complete.
- B. Install chimney seal as directed by the manufacturer.
- C. Secure the chimney seal to the casting and structure to prevent infiltration.
- D. Internal chimney seals shall be installed only when directed by the Engineer.

3.08 External Chimney Seals, Cretex X-Lite External Seal or approved equal.

- A. Clean surface of casting and adjustment units to allow external chimney seal to fasten to structure.

- B. Install external chimney seal as directed by the manufacturer.
- C. All sanitary manholes shall have an external chimney seal installed and shall be included in the price for the manhole.

3.09 Field Quality Control

A. General

- 1. Contractor shall provide all labor and materials necessary for inspections and tests.
- 2. Engineer shall be present and observe all required testing. Contractor shall notify Engineer 48 hours before testing.

B. System Cleanup

- 1. Contractor shall ensure pipe and manholes are clean and free of material.
- 2. If system is dirty due to Contractor negligence, the system will be cleaned at the sole expense of the Contractor. Jetting may be required. Complete before final inspection and televising.

C. Testing

- 1. Testing shall begin only after the system has been cleaned.
- 2. Lamping: Engineer will verify installation is true to line and grade, joints are home, and deflection has not occurred.
- 3. Deflection Testing: Testing is required for all flexible pipe types (PVC, HDPE, CCF). Deflection testing shall occur at least 30 days after the main has been backfilled to finish grade. Testing shall be done in the presence of the Engineer. Deflections shall be determined by use of a mandrel.
  - a. Mandrel shall have a minimum diameter equal to 95 percent of the Average Internal Diameter of the pipe. The 5 percent deflection shall include deflection from burial and manufacturing process.
  - b. Mandrel shall be constructed of rigid steel, be non-adjustable, and have an odd number of legs (9 legs minimum). Its effective length shall not be less than its nominal diameter.
  - c. Owner reserves the right to measure the deflection at any time during the warranty period. Deflections greater than 5 percent shall be considered failure and the Contractor may be required to re-excavate, replace the pipe if necessary, recompact the backfill and restore the surface with no additional costs to the Owner for such work.

4. Televising

- a. Contractor must clean all lines prior to televising.
- b. It shall be the contractors responsibility to have the sanitary sewer televised.
- c. Contractor shall provide a DVD copy of the televising with audio description and printed stationing of each lateral service accurate to the foot. Each run shall be identified by location and manhole to manhole description.

3.10 Measurement and Payment

- A. Sanitary Sewer Pipe: Shall be paid for by the lineal foot (LF) for each size, type, and depth range specified on the Plans. Price shall include all materials and labor necessary for installation, including all excavation, bedding, backfilling, and compaction. Pipe shall be measured from connection point or from center to center of manholes.
- B. Manhole Structure: Shall be paid for by each (EA) for the diameter specified on the Plan up to 8 foot in depth. Price shall include manhole structure, frame and casting, external seal, and adjustment to finish grade surface.
- C. Manhole Riser Section: Shall be paid for by the lineal foot (LF) for the diameter specified on the Plan greater than 8 foot in depth. Measurement shall be from the rim elevation to the invert of the manhole and shall include all materials and labor necessary for installation.
- D. Outside Drop Inlet Pipe: Shall be paid for by the lineal foot (LF) measured from the outlet invert to the inlet invert. Price shall include pipe, pipe encasement, base slab, fittings, and concrete collar.
- E. Wyes: Shall be paid for by each (EA) for the size and type specified on the Plan. Price shall include all materials and labor necessary for installation.
- F. Riser Pipe: Shall be paid for by the lineal foot (LF) measured vertically from centerline of sewer main to the top of the elevation. Price shall include all materials and labor necessary for installation including concrete reinforcement around the wye and riser.
- G. Connect to Existing System: Shall be paid for by each (EA) and shall include all material and labor costs necessary for the connection including fittings, core drilling, and reconstruction of existing inverts.
- H. Plug: Shall be paid for by each (EA) for the size and type specified on the Plan.
- I. Bulkhead and Abandon Existing Sewer: Shall be paid for by each (EA) bulkhead completed and shall include the cost of filling the existing sewer line as specified.
- J. Internal Seal: Item shall be paid for by each (EA). Item shall include the complete installation with all parts necessary for installation. Item shall only be installed when directed to do so by the Engineer.

K. All other work and costs of this Section shall be incidental to the Project.

END OF SECTION