

33 3000 SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. The work in this section includes the installation of sanitary sewer piping, manholes, cleanouts and other appurtenances.

1.2 RELATED SECTIONS

- A. 31 2200 Earthwork

1.3 QUALITY ASSURANCE

- A. All work shall be done in accordance with the standards and specifications of the jurisdiction having authority.
- B. The latest standards and specifications of the authority having jurisdiction shall be considered "the specifications" for the project.

1.4 SUBMITTALS

- A. The contractor shall submit product data and other material to demonstrate the compliance with the requirements of these specifications of all products proposed for review to the Engineer via the Architect. Submittals shall include compliance with applicable standards, dimensions and specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The Contractor is to furnish all tools, barriers, signage and other equipment necessary to execute the work in an accurate and non-hazardous manner.
- B. Backfill material per the requirements of the specifications or other authority having jurisdiction.
- C. Piping, cleanouts, manholes and other appurtenances as indicated on the drawings.

2.2 DUCTILE IRON PIPE (DIP)

- A. Shall be pressure class 350 and centrifugally cast in accordance with ANSI A21.5/ AWWA C151 and ASTM A74.
- B. Exterior shall be asphaltic coated in accordance with ANSI/AWWA C151/A21.51.

- C. Interior shall be cement-mortar lined in accordance with ANSI/AWWA C104/A21.4.
- D. Rubber Gasket joints shall be in accordance with ANSI/AWWA C111/A21.11
- E. Fittings shall be push on or mechanical type joints in accordance with ANSI/AWWA C111/A21.11 latest revision. All ductile iron fittings shall have a minimum working pressure rating of 250 psi and minimum iron strength of 25,000 psi. All fittings shall be cement mortar lined in accordance with AWWA C104/ANSI A21.4 and the outside shall be bituminous coated.
- F. Other reference specification ASTM A716-08.

2.3 POLYVINYL CHLORIDE (PVC) PIPE

- A. All pipe shall be manufactured in accordance with ASTM D2241 and shall be SDR 35.
- B. Joints shall be gasketed, bell-and-spigot, push-on type conforming to ASTM D3212.
- C. Installation shall be in accordance with ASTM D2321 and specification.
- D. Pipes and Fittings: All PVC pipe and fittings through 15" shall meet the requirements as specified under ASTM D3034. All pipe and fittings shall be suitable for use as a sanitary sewer conduit. Bell joints shall consist of an integral wall section with elastomeric gasket joint which provides a water tight seal. Standard laying lengths shall be 13.0 - 20.0 feet (+ 1 inch). The pipe shall be capable of passing all test which are detailed in this specification. Minimum wall thickness for pipe through 15" in diameter shall be as specified under SDR 26 in ASTM D3034. PVC is not allowed for sewers greater than 18" in diameter or more than 18 feet of cover.
- E. Each length of pipe shall be marked with the manufacturer's name, trade name, nominal size, class, hydrostatic test pressure, manufacturer's standard symbol to signify it was tested, and date of manufacture. Each rubber ring shall be marked with the manufacturer's identification, the size, the year of manufacture, and the classes of pipe with which it can be used.
- F. All PVC fittings and accessories shall meet the requirements specified under ASTM D3034 or F679 and shall be manufactured and furnished by the pipe supplier. They shall have bell and/or spigot configurations compatible with that of the pipe and shall have an equivalent wall thickness.

2.4 CLEANOUTS

- A. Before ordering materials, contractor is to submit shop drawings showing manufacturers information and specifications for cleanouts.
- B. No material is to be ordered until engineer has reviewed the shop drawings.
- C. Shall be traffic rated

2.5 PRECAST STRUCTURES

- A. Precast structures shall be constructed in compliance with ASTM C 478-09 and the specification. Manhole diameters shall be 4-foot minimum.
- B. Precast structures joints shall be tongue and groove. Steel reinforcement shall meet the requirements of ASTM A-185, latest revision. Cement shall meet ASTM C-150, latest revision.
- C. Each section of the structure shall be stamped with the name of the manufacturer, the date of the section was manufactured and where it was manufactured.
- D. Precast manholes shall be constructed of Portland Cement concrete with a compressive strength of not less than 4,000 pounds per square inch at an age of 28 days. The wall thickness shall not be less than 5 inches. Manholes over 12' deep shall be placed on a reinforced slab.
- E. Sections shall be joined using O-ring rubber gaskets, flexible plastic gaskets conforming to the applicable provisions of ASTM C443, or an approved bituminous joint material. Precast concrete manholes shall consist of precast reinforced concrete sections with eccentric, top section and a base section
- F. Structures shall be installed per specification and manufacturer's guidelines.
- G. If not specified by the authority having jurisdiction or the specification, all steps shall be M.A. Industries PS2-PF encased per ASTM D 4101 or approved equal. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit if structure is less than 3-ft in depth.
- H. Manhole frames and covers shall be traffic rated cast iron with a coat of asphaltic paint applied at the foundry, 24-inch inside diameter by 7" to 9" riser with 4 inch minimum width flange and 26-inch diameter cover or as specified on the drawings or by the authority having jurisdiction.
- I. Pre-molded rubber boots with stainless steel bands shall be used for connecting sewer pipe to manholes. The boot shall be sized to suit the outside diameter of the type pipe being used.
- J. Brickwork required to complete the precast concrete manhole shall be constructed using 1 part Portland cement to 2 parts clean sand, meeting ASTM Specifications, Serial Designation C 144, thoroughly mixed to a workable plastic mixture. Brickwork shall be constructed in a neat and workmanlike manner. Cement mortar shall be used to grout interior exposed brick joints and faces. No more than 4 courses of brick with 12 inch maximum total depth of bricks may be used to adjust manhole covers.
- K. The manhole base shall be set upon a minimum 6 inch thick bed of #57 crushed stone.

2.6 CASING PIPE AND SPACERS

- A. Steel casing pipe shall be schedule 40 thickness with a minimum yield strength of 35,000psi and shall conform to the requirements of ASTM A139. It shall be fully coated on the exterior and interior with a bitumastic coating. The casing pipe diameter shall be six to eight inches greater than the "bell" diameter of the carrier pipe.
- B. Wherever steel casing is required, the carrier pipe shall be ductile iron pipe with push-on joints. Approved spacers shall be used to secure the pipe on grade. A manhole shall be placed at each end of the cased section at a distance of 5 to 10 feet beyond the end of the casing. Ductile iron pipe shall be continuous from manhole to manhole.

2.7 CONCRETE AND MORTAR

- A. Concrete shall consist of Portland cement, a fine aggregate, a coarse aggregate and water. Portland cement shall conform to Fed. Spec. SS-C-19 lb. Fine aggregate shall be a clean, sharp, well-graded sand conforming to Fed. Spec. SS-S-51. Coarse aggregate shall be uniformly graded broken stone or gravel which will pass a 1-1/2 inch screen and be retained on a 1/4 inch screen. Aggregate shall be free of clay, loam silt, or organic matter. Water used for concrete shall be clean and free from vegetable, sewage or organic matter and the total amount used shall not exceed six (6) gallons per sack of cement. Forms may be of wood or metal properly braced to prevent bulging. Concrete shall be thoroughly mixed and well vibrated into forms and around fittings. Exposed surfaces of concrete shall be protected from premature drying by being kept covered and moist for a period of seven days. After the forms have been removed, the voids in the interior surface, if any, shall be properly filled with cement mortar and the whole surface rubbed uniformly with neat cement.
- B. All mortar shall be composed of one part Portland cement to three parts sand, conforming to these specifications. All concrete shall have a compressive strength of not less than 3,000 pounds per square inch at an age of 28 days.
- C. Approved casing spacers shall be used to secure the sewer line on grade throughout the length of the casing. The spacers shall be sufficient to secure the pipe on grade.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to section 31 2200 for Earthwork related to installation of storm sewer.

3.2 SANITARY SEWER SYSTEM CONSTRUCTION-GENERAL

- A. Contractor is to engage the services of a registered land surveyor to stake all sanitary sewer locations and elevations of piping, structures, cleanouts, etc. per the plans.

- B. Piping and structures are to be inspected during construction and prior to backfilling. Any damaged structures, pipe, or other appurtenances are to be removed and replaced with new.
- C. Sanitary sewer pipes and structures are to be properly installed and backfilled before being subjected to loading. Any structures or piping that become damaged or displaced due to loading without adequate backfill shall be removed and replaced or reinstalled.
- D. Castings to be placed on top of sanitary sewer structure shall be made integral with the storm structure and be stable and sturdy under loading.
- E. Tops of structures shall be set flush with grade in accordance with the drawings.
- F. Eccentric tops shall be utilized to insure that manhole steps are accessible for entrance.
- G. Cleanout frames and covers in earth are to have a concrete collar block cast-in-place around it, 18 by 18 by 6 inches deep with top one inch above surrounding grade.
- H. Cleanout frames and covers tops in paved areas are to be flush with grade.

3.3 PIPE INSTALLATION

- A. All existing tie-in and conflict inverts and pipe sizes are to be verified before beginning construction. Any discrepancies that are discovered between the plans and actual field conditions are to be reported to the engineer immediately and the contractor is to wait for further instruction.
- B. Construct pipe from lowest invert elevation to highest. Install piping to specified location and elevations shown on plans.
- C. Trenches shall be cut true to lines and grades shown on the plans. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the plans. Where pipe bells are to be placed the trench shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length on the bottom of the trench bedding. Holes for bells shall be large enough to permit the proper installation of all joints in the pipe.
- D. Trenches shall have a minimum width of twelve (12) inches plus the diameter of the outside of the bell of the sewer main and the maximum trench width at the centerline of the pipe shall not be more than the nominal diameter of the pipe plus two feet.

- E. Shoring and Bracing: Excavations adjacent to proposed or existing buildings and structures, or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. The contractor shall also provide bracing and shoring when required to prevent damage to existing utilities, trees, or private property which are specifically required to remain.
- F. Where a sanitary sewer crosses a water main, there shall be a minimum vertical separation clearance of 18 inches between the mains. Both lines shall be DIP and one full length of sewer pipe must be located so that both joints are as far from the water main as possible. In cases where sanitary sewer lines parallel water mains, there shall be a minimum of ten (10) feet horizontal separation maintained between the mains. These distances are measured from the outside edge to outside edge of the pipes.
- G. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:
- | Size of Pipeline | Depth of Excavation Below |
|------------------|---------------------------|
| Inches | Bottom of Pipe, Inches |
| 4 to 6 | 6 |
| 8 to 18 | 8 |
- H. Pipe Joints: The ends of pipe to be jointed and the gaskets shall be cleaned immediately before assembly, and the assembly shall be made as recommended by the pipe manufacturer. Lubricant used must be non-toxic and supplied or approved for use by the pipe manufacturer.
- I. When pipe laying is not in progress, the open ends of installed pipe shall be plugged by approved means to prevent entrance of trench water into the line.
- J. DIP shall be installed per ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
- K. DIP or PVC pipe laid in rock trenches shall have 6 inches of crushed stone under the pipe.
- L. Water shall not be allowed to run or stand in the trench before the trench has been backfilled. At no time shall the Contractor open up more trench than his available pumping facilities are able to dewater. The contractor will be required to provide and operate any equipment necessary to keep the trenches free from water while pipe is being laid and the joints made.

- M. Coring Manholes: Connections to existing manholes where no plugged stubs exist shall be made by neatly cutting a hole in the wall of the existing structure with a coring machine at or near its invert, inserting a Kor-N-Seal, or approved equivalent, rubber boot.
- N. In rock excavation, the backfill from the bottom of the trench to one foot above the top of the pipe shall be finely pulverized soil, free from rocks and stones. The rest of the backfill shall not contain over 75% broken stone, and the maximum sized stone placed in the trench shall not weigh over 50 pounds. Excess rock and fragments of rock weighing more than 50 pounds shall be loaded and hauled to disposal. If it is necessary, in order to comply with these specifications, selected backfill shall be borrowed and hauled to the trenches in rock excavation.

3.4 BACKFILL COMPLETION

- A. Compact trench backfill as specified in Earthwork section.
- B. Construct pavement patch, if applicable, to restore finished surface to like new condition. Construct finish surface to provide smooth transition to existing surface.
- C. Areas that were previously grassed are to be restored to their pre-developed state.
- D. Sheeting, shoring, and bracing is to be removed and disposed of in an acceptable manner. Where sheeting is used in connection with the work, it is in no case to be withdrawn before the trench is sufficiently filled to prevent damage to banks, road surfaces, adjacent pipes, adjacent structures or adjacent property, public or private.

3.5 CLEANING

- A. All construction debris from sewer construction is to be properly disposed of.
- B. Additional soil from sewer pipe construction that cannot be used elsewhere on-site is to be disposed of at no cost to the owner.

3.6 INSPECTION AND TESTS

- A. Inspection and testing shall be performed in accordance with the jurisdiction having authority.
- B. Lines, manholes and other appurtenances are to be tested for infiltration, exfiltration, deflection, and damage.
- C. Acceptance of sanitary sewer system will not occur until all tests have been performed and acceptable results have been achieved on all items required to be tested.

END OF SECTION 33 3000