

**SECTION 33 30 00
SANITARY SEWERAGE UTILITIES**

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Sanitary sewer pipes & fittings
- B. Excavation for pipe trenches
- C. Manholes, covers, and grease traps
- D. Requirements for documentation

1.2 REFERENCES

- A. AWWA C110 - Ductile-Iron and Gray-Iron Fittings
- B. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water
- C. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in (100 mm Through 300 MM), for Water Transmission and Distribution
- D. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. through 48 In (350 mm Through 1,200 mm) for Water Transmission and Distribution
- E. ASTM A48/A48M - Standard Specification for Gray Iron Castings
- F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
- G. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
- H. ASTM D1782 - Standard Test Method for Operating Performance of Particulate Cation-Exchange Materials
- I. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- J. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- K. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.3 EXISTING UTILITIES

- A. The contractor shall obtain a Sunshine State One Call Center Certification number at least 48 hours prior to beginning any excavation. (Call Sunshine 1-800-638-4097)
- B. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings and/or electronic locating devices.
- C. Existing utility locations shown on the plans are approximate and based on available records.
 - 1. The Contractor is responsible for verifying all utilities, and notifying the Architect of conflicts and variations.
- D. The Contractor is responsible for damage to any existing utilities for which he fails to request locations from the utility owner, and for damage to existing utilities that are properly located.
- E. The Contractor shall immediately notify the Architect, if upon excavation finds the existing utility in conflict with the proposed construction or of a different size or material from that shown on the plans.

1.4 SHOP DRAWINGS AND SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Prior to installation, the Contractor shall furnish to the Architect the manufacturers' literature and data for all materials installed under this section for his approval.
- C. Complete As-Built information and plans required before final acceptance of the system.

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1. Contractor shall provide accurate record of complete system relative to manholes, cleanouts, services, fittings, pipe size, pipe material, pipe lengths, and the like.
2. Registered Surveyor shall provide all horizontal and vertical information in the Contractor's As-Built information.
3. Provide final approval of the project "As-Built" information from the regulatory agencies having jurisdiction.
4. Contractor shall camera all of the sewer lines and provide the District with a copy of the videotape.

1.5 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.
- B. Section 31 20 00 – Earthwork

1.6 APPLICABLE CODES

- A. General: All construction and materials shall conform to the Florida Building Code-Plumbing, all local and national codes where applicable, and the Palm Beach County Water Utilities Department Minimum Engineering and Construction Standards
- B. Construction Safety: Perform all construction in a safe manner; follow (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD) regulations.
- C. Survey Data: All elevations on the plans or referenced in the specifications are based on North American Vertical Datum of 1988 (NAVD).

1.7 SANITARY SEWER SYSTEM

- A. Gravity sewer, lift station, and force main shall comply with the Palm Beach County Water Utilities Department Minimum Engineering and Construction, Water and Sewer Systems, or the construction standards of the municipality having jurisdiction.
 1. Submit a copy of the Florida Department of Environmental Protection Permits.

PART 2 PRODUCTS

2.1 SEWER PIPE AND FITTINGS

- A. All sewer pipe and fittings shall be non-pressure polyvinyl chloride (PVC) pipe conforming to ASTM D3034, SDR 35, with push-on rubber gasket joints or ductile iron pipe with a ceramic epoxy lining and bituminous exterior coating.
- B. Gravity sewer pipes and force mains in wellfield zones #1 and #2.
 1. Contractor shall have permission from before working in a zone 1 wellfield.
 2. Ductile iron pipe AWWA C151/A21.51; ceramic epoxy lined and bituminous exterior coatings.
 3. Polyvinyl chloride pipe, 4" and larger, AWWA C900 and AWWA C905, dimension ratio DR18.
- C. Fittings: PVC and DI pipe, over 4", use ductile iron mechanical joint fittings complying with AWWA -C110 and having coating/lining per B. Above.
 1. All fittings and accessories shall be as manufactured or supplied by the pipe manufacturer or approved equal.
- D. In addition to the above-cited specifications, all PVC sewers shall conform to the following additional requirements:
 1. The PVC sewer piping shall be of a product having a dimension ratio (DR) of 35 and minimum pipe stiffness (PS) of 46 psi.
 2. Joints: Use an integral bell gasket joint, designed so that when assembled, the elastomeric gasket inside the bell is compressed radically on the pipe spigot to form a positive seal.
 - a. The joint shall avoid displacement of the gasket when installed in accordance with the manufacturer's recommendation.
 3. Use manufacturer's recommended lubricants for joining of the pipes.

- a. No solvent cement joints accepted.
- b. Follow the pipe manufacturer's instructions for the joining of the pipe on the job, complete in the trench unless otherwise directed by the Architect.
4. Gaskets: Mold all gaskets in a circular form or extruded to the proper section and then splice into circular form, and have a properly vulcanized high-grade elastomeric compound.
 - a. The basic polymer shall be natural rubber, synthetic elastomer, or a blend of both.
 - b. The gaskets shall be of materials resistant to domestic sewage and as recommended by the manufacturer, with an adequate compressive force so as to affect a positive seal under all combinations of joint tolerance, as the gasket shall be the only element depended upon to make the joint flexible and watertight.
5. Pipe and Fittings: The pipe shall be made of PVC plastic having a cell classification of 12454-B or 12454-C or 13364-B (with minimum tensile modulus of 500,000 psi) as defined in ASTM D1784.
 - a. The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C, or 13343-C as defined in ASTM D1782.
 - b. Compounds that have different cell classifications because one or more properties are superior to those of the specified compounds are also acceptable.
 - c. Clean rework material generated by the manufacturers own production may be used so long as the pipe or fittings produced meet all the requirements of the specification.
6. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects.
 - a. The pipe shall be as uniform as commercially practical in color, capacity, density, and other physical properties.
 - b. PVC pipe and fittings showing signs of ultra-violet degradation are not allowed.
7. Pipe Marking: Clearly mark each standard and random length of pipe in accordance with the following example at intervals of 1.5 M (5') or less:
 - a. Manufacturer's Name or Trademark
 - b. Nominal Pipe Size
 - c. The PVC Cell Classification
 - d. The Legend Type e.g.- DR 35 PVC Sewer Pipe
 - e. Color: Green
8. Fittings Marking: The fittings in compliance with this standard shall be clearly marked per the following example:
 - a. Manufacturer's Name or Trademark
 - b. Nominal Pipe Size
 - c. The Material Designation PVC PSM
9. Adapters: If field conditions require adapters, install per Architect's direction.
10. Plugs: Service plugs shall be flexible virgin polyvinyl chloride as supplied by Fernco Joint Sealer Company.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

- A. The contractor shall provide for the furnishing of all labor, equipment, and materials to perform all operations necessary to construct and test the wastewater collection system in accordance with the plans and specifications.
- B. Obtain permission from the Health Department and utility company having jurisdiction before install the sewerage systems.

C. Construct on site utilities in accordance with the Palm Beach County Water Utilities Department Minimum Engineering and Construction Standards.

1. Materials, installation, cleaning, testing, and disinfection

D. Waterproof interior of manholes, do not provide ladder rungs, and label covers.

3.2 EXCAVATIONS

A. Keep trenches as nearly vertical as possible and if required, provide sheeting and bracing.

1. Keep sheeting in place if in the opinion of the Architect or Contractor, damage could result from its removal.

B. Except in rock, water-bearing earth, or where a granular or concrete base is used, stop mechanical excavation of trenches above the final grade elevation laying of pipe on a firm, undisturbed native earth bed.

1. If over digging occurs, remove all loosened earth and bring the trench bottom back to grade with granular material.

C. Carry excavations and trenches in rock to a depth of not less than 4" below the pipe bottom, and then fill with granular material or washed rock.

D. Width of trenches shall be such as to provide adequate space for placing and jointing pipe properly, keep trench to a minimum width.

E. Remove any unstable soil encountered and replace with gravel, crushed rock, or rock and sand suitably compacted.

F. All excavations shall be in conformance with Section 31 20 00, Earthwork.

3.3 DEWATERING

A. The Contractor shall provide adequate equipment for the removal of storm or surface water that may accumulate in the excavation areas.

B. If the contractor encounters subsurface water he shall use an approved method, properly dewater the excavation site suitably dry for working, form setting, concrete pouring, and pipe installation.

C. This method shall be in place as necessary to maintain the excavation in a dry condition for such operations.

D. All cost for this equipment and work shall be at the Contractor's expense.

3.4 PREPARATION OF TRENCH BOTTOM

A. Do not allow water in the trenches during preparation of the trench bottom or during installation of pipe, unless authorized by the Architect.

B. Shape a continuous trough to receive the bottom quadrant of the pipe barrel.

1. Excavate bell holes so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom.

C. Carefully prepare the trench bottom and place the pipe so that when in final position, the pipe is true to line and grade.

D. When sand, crushed rock, gravel or pea rock are used to support the pipe, place such material in the trench bottom a minimum of 4" below the bottom of the pipe, and form the trough as described above to uniformly support the bottom quadrant of the pipe barrel.

3.5 INSTALLATION OF SEWER PIPE

A. Install sewer pipe in accordance with ASTM D2321 and the Uni-Bell Plastic Pipe Association's Recommended Practice for the Installation of PVC Sewer Pipe.

B. Protect pipe during handling against impact shocks and free falls.

1. Keep pipe clean at all times and do not use pipe that does not conform to the specifications.

C. Start laying the pipe at the lowest point, with spigot ends pointing in the direction of flow.

1. Lay all pipes with ends abutting and true to line and grade.

2. Carefully center pipe so that when laid they will form a sewer with a uniform invert.

3. Lay pipe in accordance with manufacturer's requirements as reviewed by the Architect.
- D. Lay pipe accurately to the line and grade as shown on the plans.
 1. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be jointed or of the factory-made jointing material shall be clean and dry.
 2. Use lubricant, primers, adhesives, etc., as per the pipe or joint manufacturer's specifications.
 3. Place the jointing materials or factory-fabricated joints, fitted, joined, and adjusted in such a manner as to obtain a watertight line.
 4. As soon as possible after making the joint, place sufficient backfill material along each side of the pipe to prevent movement of pipe off line and grade.
- E. Properly plug the exposed ends of pipe to prevent earth, water or other substances from entering the pipe when construction is not in progress.
- F. Properly grout the Harco or approved equal manhole couplings in place at each pipe connection into a manhole wall.

3.6 BACKFILLING TRENCHES

- A. Backfill all trenches and excavations immediately after laying pipe unless directed otherwise.
 1. Do not permit water to rise in open trenches after placement of pipe.
 2. Backfilling shall comply with Section 31 20 00.
- B. Backfill trenches with approved material free from large clods, stones or rocks larger than 1" in diameter, and carefully deposited in layers, not exceeding 6", until enough fill is placed to provide a cover of not less than 12" above the pipe.
 1. Place each layer, and then carefully and uniformly tamp, to eliminate the possibility of pipe displacement.
 2. Place the remainder of backfill material, moisten, and compacted, to 95% of AASHTO Specifications T-180 in landscaped areas and 98% of maximum density in paved areas.
- C. Refill, compact, smooth, and make to conform to surrounding grade any trenches improperly filled or settled.
- D. Unless directed or shown on the plans, backfill trenches in or through roadways as specified above.
 1. Except that the fill above 1' over the pipe shall be deposited in layers not to exceed 12" thickness, moistened, and compacted to density equal to greater than that of adjacent material so that pavement can be placed immediately.

3.7 CONCRETE ENCASEMENT OF SEWER PIPE

- A. May use mechanical equipment to completely excavate the trenches for pipe encasements.
- B. Prior to formation of the encasement, in at least two places provide temporary supports consisting of timber, wedges, or masonry to support the pipe, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket, and the other near the spigot end.
- C. After the completion of jointing the pipe, uniformly pour concrete beneath and on both sides of the pipe.
 1. Use sufficient concrete so that encasement is at least 4" thick at all points.

3.8 MANHOLES

- A. Provide pre-cast concrete manholes with 4000-psi min compressive strength and grade-60 steel.
- B. Contractor may use other materials with prior approval of the Architect and the Owner.
- C. Construct the manholes to ASTM C478 requirements and the following:
 1. Minimum wall thickness shall be 8", and the inside diameter of base sections 48".
 2. Provide minimum 8" thick pre-cast reinforced base monolithically casted with the bottom section of manhole walls.
 - a. Extend the base slab a minimum of 4" from the outside of the manhole.
 3. Lifting holes through the structures are not permitted.

- a. All holes shall be grout filled to a smooth surface.
4. Minimum height of base sections shall be 3' from the bottom of base slab.
5. Join manhole sections with a mastic compound or a round compression ring of neoprene material set in annular spaces cast into the spigot end of a bell spigot-type joint.
 - a. Uniformly compress the mastic compound or ring between the sections to form a watertight joint.
 - b. After the assembling the sections, point and fill the remaining space in the joint with a dense cement mortar and finish to a smooth, continuous surface inside and outside the wall sections.
6. Pre-cast manhole cones, when used, shall terminate at such elevations as will permit laying up a minimum of two and maximum of four courses of clay brick under the manhole frame to make allowance for future street grade adjustment.
 - a. Approved HDPE adjusting rings may be used in-lieu of brick.
 - b. Mechanically attach HDPE rings to the manhole frame and the cone.
 - c. Submit detail for approval prior to construction.
7. Use dense, hard burned, common clay brick conforming to ASTM C62 latest revision for manhole construction, brick absorption shall be between 5 and 25 grams of water in one minute by dried brick, set flat face down, in $\frac{1}{8}$ " of water.
 - a. Thoroughly slush all brick with mortar at every corner.
8. Construction of invert channels shall be:
 - a. Smooth and semicircular in shape conforming to inside of adjacent sewer section.
 - b. Changes in direction of flow shall be smooth curve of as large a radius as the size of the manhole will permit.
 - c. Changes in size and grade of channels shall be gradual and even.
 - d. Form invert channels by one of the following methods:
 - i) Directly into concrete manhole base, build up with block and mortar, lay half tile in concrete, or
 - ii) Lay full section of sewer pipe through manhole and cut out top half after the surrounding concrete has cured; cut shall be smooth and even.
 - e. Make the manhole floor outside of channels smooth, and slope toward channels at a slope of 1" per foot.
9. Where shown on the drawings, the contractor shall place stub outs for future extensions, with a plug marked with a metallic locating device.
10. Service laterals not permitted through manhole walls.
11. Outside drop, connections are required when the vertical distance between pipe inverts exceeds 2'.
 - a. Cast required drop connections monolithically with the manhole elements.
12. Cover the entire inside of the manhole with two coats (8-mil each) of Koppers 300M Bitumastic Paint.
 - a. Remove all dirt, dust, oils, compounds and other foreign matter, and etch the surfaces with 18% to 20% muriatic acid solution.
 - b. Then thoroughly rinsed all surfaces with clear water prior to paint application, completely dilute the acid solution prior to removal from the system.
13. Jointing and Plastering, use mortar for jointing and plastering shall consist of one part Portland cement and two parts of fine sand.
14. Grout the influent and effluent sewers in place using a waterproof, expanding grout, acceptable to the Architect.
 - a. Seal all openings and joints watertight.

15. Make all castings for manhole frames and covers of clean even grain, tough gray cast iron.
 - a. The castings shall be smooth, true to pattern, and free from projects, sand holes, warp, and other defects.
 - b. The horizontal surfaces of the frame cover seat and the under surface of the cover which rests upon the cover seat shall be machined.
 - c. The cover shall not rock after seating in any position of its associated frame.
 - d. Machining is required only on those frames and covers intended for vehicular traffic.
16. Coat castings with coal tar pitch varnish that shall make a smooth coating that is tough and tenacious when cold, but not tacky or brittle.
 - a. Iron used for castings shall conform to ASTM A48/A48M for Class 30, gray iron.
17. Cast the words "Sanitary Sewer" and the name of the Owner in the cover.
 - a. Set the manhole frames and covers so that the top cover is flush with the finished grade or as indicated on the drawings.
 - b. The manhole frame and cover type shall be as indicated on the drawings.
 - c. Frames are suitable for future additions of cast iron rings for adjustment of top elevation.
 - d. Machine the seating surfaces between frames and covers to fit true.
 - e. No plugging or filling is allowed.
 - f. Cast pick type lifting holes into lids, but do not go clear through the lid.
18. When a manhole is in low-lying areas or when in the opinion of the Architect an unusual condition exists, a sealed locking type lid may be required.
 - a. Installation of this type of lid is as directed by the Architect.

3.9 GREASE TRAPS/OIL SEPARATORS

- A. Provide concrete grease trap tanks, 1250-gallon max per tank, with 2½" drop between tanks.
 1. Capacity = seats in dining room x part of day x loading factor.
 2. Internal concrete baffle is not required for multiple tanks.
- B. Grease traps shall resist floatation at all times, even when empty.
- C. In paved vehicle traffic areas, grease trap shall meet H-20 truck loading requirements.
 1. Place top slab reinforcing in the bottom of the slab, not the top.
- D. Connect dumpster pad drain to the grease trap.
- E. Place two-way cleanouts before, after, and between tanks.
- F. Provide traffic covers and drop pipes as required.
- G. Provide a neutralizing tank for acid waste pipes before draining into the sanitary system.
- H. The effluent from the oil/water separator for vehicle wash down and garage areas shall drain into the sanitary sewer system.
 1. The tank shall be as manufactured by Highland Tank Co., Storytown, Pa. or approved equal.
 2. The tank shall be doubled wall with a 30-mil thick exterior coating.
 3. Have metallic risers with a corrosion-resistant coating, watertight manhole cover (fiber-lite if over 36" dia.), and an electronic alarm panel installed inside the building.
 4. Contractor to provide the required dead-man anchors

3.10 CROSSING OF WATER LINES WITH SEWERS

- A. Use ductile iron pipe in lieu of PVC pipes in the following conditions.
 1. When sewer line is less than 18" under a water line.
 2. When a sewer line is above a water line.
 3. The pipe is less than 4' from the top grade to the invert of the pipe.
 4. When there is less than 10' of horizontal separation between the water and sewer pipes.

3.11 SEWER TEST

- A. On completion of each block or section of sewer, or such other times as the Architect may direct, the block or section of sewer is to be cleaned, tested and lamped.
 - 1. Each section of the sewer is to show on examination from either end, a full circle of light between manholes.
 - 2. Each manhole, or other appurtenance to the system, shall be of the specified size and form, to be watertight, neatly and substantially constructed, with the top set permanently to exact position and grade.
 - 3. Make all repairs shown necessary by the inspection; broken or cracked pipe replaced, all deposits removed, and the sewers left true to line and grade, entirely clean and ready for use.
 - 4. The Architect of Record and the City/County shall witness the sewer lamping.
- B. The allowable limits of infiltration or exfiltration for the system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours.
 - 1. No additional allowance allowed for house service lines.
 - 2. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per manhole per 24 hours.
 - 3. The Architect may direct testing of part or the entire system for infiltration or exfiltration.
 - 4. Prior to testing for infiltration, pump out the system so that normal infiltration conditions exist at the time of testing.
 - 5. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or other Architect approved methods.
- C. Conduct the exfiltration test by filling the portion of the system being tested with water to a level equal to the lowest part of the manhole frame.
 - 1. Contractor may substitute an air test for the water exfiltration test upon approval by the Architect, the District's Building Department, and the City.
- D. Conduct tests on portions of the system not exceeding three manhole sections or 1000'; whichever is greater, unless directed by the Architect.
 - 1. Run tests continuously for 2 hours.
- E. Where infiltration or exfiltration exceeds the allowable limits specified herein, the Contractor shall locate and repair the defective pipe, joints, or other faulty construction.
 - 1. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits.
 - 2. Repair all visible infiltration regardless of test results.
- F. Provide mandrel test of all flexible piping systems using a mandrel with an effective outside diameter of at least 95% of the actual pipe inside diameter.
 - 2. Test will occur 30 days or more after the pipe trench is backfilled.
- F. The Contractor shall provide all labor, equipment, and materials and shall conduct all testing required under the direction of the Architect.
 - 1. The Contractor shall include the cost of this work in the base bid.

3.12 INSPECTIONS

- A. The Contractor shall notify the City and the Architect of Record at least 24-hours prior to beginning construction in order to arrange inspection of the sanitary sewer.

3.13 RESTORATION OF SURFACES AND/OR STRUCTURES

- A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or any other disturbed surfaces or structures to a condition equal to that before the work began and to the satisfaction of the Architect and shall furnish all labor and materials incidental thereto.

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- B. Restoration of surfaces and/or structures shall comply with all requirements of the applicable governing agencies.

3.14 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain accurate and complete records of work items completed.
- B. All as-built information submitted to the Architect shall be sufficiently accurate, clear, and legible to satisfy the Architect that the information provides a true representation of the improvements constructed.
- C. Upon completion of construction, the Contractor shall submit to the Architect one complete set of as-built construction drawings.
 - 1. These drawings shall be marked to show as-built construction changes and dimensional locations and elevations of all improvements and signed by the Contractor.
- D. A registered land surveyor shall certify all as-built information for water and sewer lines and submit in a format acceptable to all local reviewing agencies.
- E. Contractors shall camera the sewer lines and provide the District with a copy of the videotape.

END OF SECTION