

ALABAMA DEPARTMENT OF TRANSPORTATION

DATE: March 4, 2015

Special Provision No. 12-1265

EFFECTIVE DATE: June 1, 2015

SUBJECT: Sanitary Sewers.

Alabama Standard Specifications, 2012 Edition, SECTION 645 and SECTION 853 shall be revised as follows:

SECTION 645 SANITARY SEWERS

645.01 Description.

This Section shall cover the work of the following:

- furnishing and installing new sanitary sewers, force mains, and manholes
- removing, replacing, and resetting existing sanitary sewers, force mains, and manholes
- constructing connections to existing sewers and manholes

All work performed and materials used shall be in accordance with ALDOT plans and specifications and the Utility's requirements. In the event that there is a conflict between the ALDOT specifications and the Utility's requirements, the more stringent requirement shall govern.

645.02 Materials.

Materials furnished for use shall conform to the requirements of Section 853 and other appropriate Sections of Division 800, Materials.

The pipe strength shall be in accordance with the requirements of Section 853 unless otherwise noted by the project plans or determined by the actual laying conditions.

Concrete used for construction of sanitary sewers, force main, and manholes shall be Class A concrete in accordance with the requirements given in Section 501.

645.03 Construction Requirements.

(a) General.

1. Sanitary Sewer.

Pipe shall be laid in the presence of the Inspector, and shall not be covered until allowed by the Project Manager. Pipe that is damaged or deemed unfit for use by the Department due to negligence, improper handling, or improper installation shall be replaced by the Contractor without additional compensation.

All new pipes shall be handled in such a manner as to prevent damage to the pipe and pipe lining. The interior of all pipes shall be free from dirt and debris. All material shall be stored in the appropriate manner to protect the materials from damage by freezing and subsequent handling.

The construction methods employed in the adjustment, relocation, and placement of the sewer lines shall be in accordance with the current codes and practices of the Utility Company involved.

Work required for the adjustments of sewer mains, fittings, and service lines shall be performed by the Contractor in such a manner that shall limit interruption of the service for a minimum period of time. Notice shall be made by the Contractor to the Customers affected by the service interruption at least four hours but not more than 72 hours prior to service interruption.

When installing non-metallic sewer force main pipe, the Contractor shall install a metallic tape on the pipe or provide other suitable means to allow for location by electronic detection devices.

When ductile iron sewer pipe and fittings are located in potentially corrosive soil conditions, the pipe shall be wrapped in polyethylene sheath meeting AWWA C105.

Air and vacuum valve assemblies shall be installed in the force main to allow for the release of potentially trapped air along elevation changes in the force main as show on the plans. The air and vacuum valve assembly shall be as detailed in the project plans and specifications.

When abandoning an existing sanitary sewer, the sanitary sewer shall be cut, filled with cement mortar flowable backfill (Section 260, Mix 4), and the ends shall be capped.

2. Manhole.

Pre-cast concrete manholes shall be constructed in accordance with **AASHTO M 199**. Manholes shall be smooth and free from fractures, chips, and honeycombs. Care shall be taken not to damage the manhole sections during handling and installation. The manhole shall be constructed to minimize the number of manhole joints.

The invert and bottom curves of all manholes shall be neatly and accurately built and formed to facilitate the entrance and flow of sewage over them.

When required, a branch pipe consisting of one segment of ductile iron pipe of the required size shall be built into manholes to receive either present or future branch lines. Branch lines for future flows shall have an Engineer approved mechanical plug.

New manholes shall be supplied with Engineer approved cast-in or cored flexible manhole pipe connectors (boots) for each pipe cutout. The flexible manhole pipe **connector (boot) shall meet the requirements of ASTM C 923**. The connector shall be installed in the manhole wall in accordance with the manufacturer's recommendations.

Existing manholes cored for connection of sewer pipe shall be fitted with Engineer approved flexible manhole pipe connectors (boots). The flexible manhole pipe connector (boot) shall meet ASTM C 923 requirements. The connector shall be installed in the manhole wall in accordance with the manufacturer's recommendations.

All manhole pipe **connectors** (boots) shall be sized specifically for the pipe material, pipe size, and manhole size being used.

Joints in riser and cone sections shall have a rubber gasket or an approved equal meeting the requirements of ASTM C 443.

Manholes shall be provided with steps, inflow dishes, chimney seals, and linings as required by the project plans and specifications.

3. Abandon Existing Manhole.

Abandoning an existing manholes shall include breaking the manhole off to a depth of three feet below grade, creating holes for drainage in the bottom, furnishing, placing and compacting sand or sand-clay backfill to the original grade, removing and cleaning the frame and cover, and transporting the frame and cover to the Utility.

4. Resetting Manhole Cone-Shaped Top Section (Cone).

Manholes requiring the cone section to be removed and replaced to lower or raise the manhole top elevation more than two feet, to allow for the addition/removal of a manhole unit section, without moving the structure location shall be considered a manhole cone reset. All work shall be done in a workman like manner by competent workmen and the manhole structure re-established in proper working order at its new elevation. Any manhole material broken, destroyed, lost, or rendered unfit for reuse through carelessness, negligence, or improper handling of the work, shall be replaced by the Contractor without extra compensation.

When adjustments to manholes require the removal of a portion of the existing manhole, the Engineer shall designate that portion of the structure to be removed. The removal cost shall be included in the unit price bid for the manhole cone reset.

When required to reach the elevation shown on the project plans, the manhole frame and cover shall be raised or lowered using brick and mortar, concrete "donut" rings, cast iron riser ring, or Engineer approved equal.

The resetting of an existing manhole cone section shall be in conjunction with installation of manhole unit sections.

5. Resetting Manhole Frame and Cover.

Manhole frame and covers that are raised or lowered in top elevation less than 2 feet {600 mm} without removing the manhole cone or moving the structure location shall be considered reset. All work shall be done in a workmanlike manner by competent workmen and the unit re-established in proper working order at its new elevation. Any material broken, destroyed, lost, or rendered unfit for reuse through carelessness, negligence, or improper handling of the work, shall be replaced by the Contractor without extra compensation. Concrete and brick masonry work shall conform to requirements of Sections 620 and 613, respectively. The Manhole frame and cover shall be raised or lowered using brick and mortar, concrete “donut” rings, cast iron riser ring, or Department approved equal.

6. Manhole Drop Connection.

Where required on the plans, a drop connection shall be constructed at manholes as detailed in the project plans and specifications. Piping for drop connections shall be ductile iron except where noted otherwise on the Plans.

(b) Excavation and Foundation.

The trench shall be excavated true to established lines and grades as shown on the project plans. Tunneling will not be permitted unless authorized in writing. Trenches shall be excavated at least 9 inches {230 mm} on each side of the pipe. Trenches shall be properly sheeted or braced wherever needed to prevent cave-in or loose soil from falling into the trench. Sides of the trenches shall be kept as near vertical as possible. Bell holes shall be excavated to insure that the pipe rests upon the bottom of the trench for its full length.

In the event that the bottom of the trench is in rock or is unsuitable material, the trench shall be excavated at a minimum of 6 inches {150 mm} below grade or as directed by the Engineer. The trench shall then be backfilled with crushed stone as specified in Section 853 up to the proper grade elevation.

All excavated material that is not suitable for use as backfill shall be removed from the project site or otherwise satisfactorily disposed.

The trench shall be dewatered to prevent standing or running water, and to allow for proper installation of the sewer.

(c) Laying.

The laying of pipe in finished trenches shall be started at the outlet end and shall be installed up grade with the spigot end pointing in the direction of flow. The pipe shall be laid to the line and grade shown on the project plans. The pipe shall then be examined to make sure that it is free of defects. Pipe shall be fitted and matched to form a sewer with a smooth, uniform invert. The pipe shall be installed in accordance with the pipe manufacturer’s recommendations and as directed by the Engineer.

Pipes shall be lowered so as to avoid damage and unnecessary handling in the trench. The hubs and bells shall be clean when laid. The pipe shall be cleaned of debris and dirt when jointing the pipe. The end of the pipes shall be securely closed when laying is stopped for the night to prevent animals and water from entering the pipe.

Wyes or tees shall be installed along with lateral sewer pipe where designated on the project plans to connect existing or future services. When laterals are required on the plans or instructed by the Engineer, the lateral shall extend to the right-of-way line or as directed by the Engineer. When the lateral is not connected to an existing lateral, the end shall be plugged as specified by the Engineer.

Force Mains shall have a minimum cover of 36 inches {910 mm} and 48 inches {1.220 m} when under pavement. Concrete thrust blocks shall be placed along the force main at vertical and horizontal bends and fittings. The thrust block shall be poured against undisturbed earth.

Walking and working on or over the completed sewer line, except as necessary for backfilling and tamping, will not be permitted until at least 1 foot {0.3 m} of backfill is in place over the top of the pipe.

Air and vacuum valves for force mains shall be placed along the force main as required by the project plans.

(d) Joints.

All joints shall be sealed for the entire circumference of the pipe providing an acceptable watertight joint.

The installation of rubber or other type gasket joints shall be in accordance with manufacturer's recommendations and as directed by the Engineer. No joint shall be finished until the two next joints in advance have been placed. Any joint that is disturbed after jointing shall be removed, cleaned, and **reinstalled**.

Where a restrained joint is required on the project plans, locked mechanical joint retainer glands or restrained joint gaskets of adequate strength to prevent movement of the force main shall be used in addition to the concrete thrust block. Retainer glands shall be the type shown on the plans or designated by the Engineer and shall be installed in accordance with the Utility Company requirements.

(e) Backfilling.

Backfilling shall be performed immediately after inspection as directed by the Engineer to secure the pipe position prior to proceeding to the next section.

All trenches and excavations shall be backfilled with approved natural soil or, when directed by the Engineer, with foundation backfill material.

The backfill material shall be carefully deposited equally on both sides of the pipe in uniform layers not to exceed 6 inches {150 mm} in compacted thickness to a density of not less than 95 percent of AASHTO **T99** maximum density. Backfill that is not under roadbeds shall be compacted as directed by the Engineer to be consistent with surrounding materials.

Where roadways and other crossings are disturbed by placing the sewer, the Contractor shall restore them to their original condition and shall replace all surface material and all paving, sidewalks, sod, or other disturbed surfaces, furnishing all necessary new materials without extra compensation except as provided in this section. Topsoil disturbed by excavation across private property shall be replaced as nearly as possible to its original position.

After completing the backfill, the Contractor shall promptly remove all surplus material, rubbish, and all equipment, leaving the site and adjacent areas in a neat and presentable condition.

(f) Connection to Existing Sewer System.

Connection to existing sewer shall be made as shown on the plans and as directed by the Engineer. Connection shall be made to minimize interruption of service. Where required to allow for continuous service, bypass pumping shall be performed and shall be incidental to the installation of the sanitary sewer.

Connection to an existing manhole shall be made by coring the manhole wall and installing a Engineer approved manhole pipe **connector** (boot). The void space around the boot and manhole shall be filled with non-shrinking grout.

Connection of dissimilar type **pipes** shall be made with a **coupler** or adapter as approved by the Engineer.

(g) Testing.

After completion of the installation of the sanitary sewer, all lines shall be tested. All lines shall be cleaned of dirt and debris prior to testing. Debris and dirt shall be removed from the sewer system and not flushed to the next segment of sewer.

The sanitary sewer and force main shall be either air tested or hydrostatic tested as required by the Engineer.

All manholes shall be tested as required by the project plans and specifications. Testing of manholes and structures shall be performed after curing of linings. Any leakage in the manhole or structure, before, during, or after the test shall be repaired by the contractor for no additional compensation.

645.04 Method of Measurement.

(a) Sewer Pipe.

The actual accepted length of sanitary sewer and force main laid or **re-laid** will be measured in linear feet {meters} along the center of the line, complete in place.

(b) Fittings.

Ductile iron fittings will be measured by the fitting's weight in pounds {kg}. Bolts and other miscellaneous items will not be included in the weights. Payment will be based on the manufacturer's catalog weight of the supplied fitting.

(c) Stacks and Laterals.

The actual accepted length of service stacks and laterals will be measured in linear feet {meters} along the center of the line, complete in place.

(d) Abandon Existing Sanitary Sewer.

The abandonment of an existing sanitary sewer will be measured per linear foot of sanitary sewer abandoned.

(e) Sanitary Sewer Lateral Cleanout.

A sanitary sewer lateral cleanout will be measured per each complete cleanout required.

(f) Retainer Gland.

Retainer glands will be measured per each retainer gland required.

(g) Manhole.

Manholes will be measured per each as individual units including footing, bottom slab, bench, wall sections, cone, casting, and manhole cover. Manholes shall also include steps, lining, chimney seal, and inflow dish as shown to be required on the plans. The maximum height of the measurement of a manhole for payment will be 6 feet {2 m}. This will be measured from the top of the bottom slab to the top of the cover. The additional height of a manhole above 6 feet {2 m} that is required for raising or lowering a manhole will be measured in manhole units.

(h) Manhole Unit.

Manhole wall sections required to raise or lower an existing manhole, or lower a new manhole, will be measured per each manhole unit. The manhole unit will be in increments of 2 feet {610 mm} and shall match the structure being raised or lowered. Required increments that are less than 2 feet {610 mm} will be measured as a complete manhole unit.

(i) Manhole Cone Reset.

Manhole cone reset will be measured per each as one complete unit of the manhole cone shaped top section and manhole frame and cover requiring removal and replacement when raising or lowering the elevation of an existing manhole.

(j) Manhole Frame and Cover Reset.

Manhole frame and cover reset will be measured per each as one complete unit of the manhole frame and cover requiring removal and replacement when raising or lowering and existing manhole without the addition or removal of manhole units (less than two feet {610 mm}).

(k) Connection to Existing Manhole.

Connection to existing manhole will be measured per each connection.

(l) Abandon Existing Manhole.

The abandonment of an existing manhole will be measured per each manhole abandoned.

(m) Manhole Drop Connection.

Manhole drop connection will be measured per vertical foot {meter} of drop from entrance of the sewer pipe to the invert of the manhole including tee, bends, fittings, and pipe.

(n) Air and Vacuum Valve Assembly.

An air and vacuum valve assembly will be measured per each complete assembly as detailed in the project plans and specifications.

(o) Sanitary Sewer Lift Station.

A sanitary sewer lift station will be measured per each complete lift station.

645.05 Basis of Payment.

(a) Unit Price Coverage.

1. General.

Final acceptance of this work shall be subject to approval by the Utility Company involved, therefore, the Engineer may withhold payment for this work until the Contractor has obtained the Utility's written approval that the work performed complies with the local codes and requirements of the Utility Company.

2. Sewer Pipe.

The accepted length of sanitary sewer and force main laid or **re-laid** will be paid for at the respective contract unit prices for the types and sizes specified in the proposal including the excavation and backfilling which shall be payment in full for furnishing, hauling, excavating, foundation preparation, laying or relaying, backfilling, compacting, **cleaning up**, and for all materials, equipment, tools, labor, and incidentals necessary to complete the work except manholes, junction boxes, or like connecting masonry. Sanitary sewer pipe being **re-laid** shall mean removing and reusing the existing sewer pipe.

The contract unit price shall be for an embedment depth of 6 feet {1.8 m} or less below the existing ground line. The length of sanitary sewer pipe laid or **re-laid**, measured as provided above, at depths greater than 6 feet {1.8 m} below the existing ground line shall have an adjusted unit price, arrived at by increasing the contract unit price by the percentage indicated in the table below.

Depth Sewer Installed Below Existing Ground Line	Percentage Contract Unit Price Bid to be Increased
More than 6 feet {1.8 m}, but less than 10 feet {3 m}	25%
10 feet {3 m} and more, but less than 12 feet {3.7 m}	50%
12 feet {3.7 m} and more, but less than 16 feet {4.9 m}	75%
16 feet {4.9 m} and more	100%

3. Fittings.

Ductile **iron fittings** will be paid for at the contract unit price for each pound {kilogram} of fitting specified on the project plans which shall be payment for all labor, materials, equipment and incidentals necessary to furnish and install the size fitting required.

4. Stacks and Laterals.

Stacks and **laterals** will be paid for at the contract unit price for the types and sizes specified in the proposal and shall include all labor, materials, equipment, and incidentals necessary to extend the lateral from the main to the right-of-way or easement line. The unit price shall also include pipe, fittings, plugs, caps, backfilling, compacting, hauling and excavating.

5. Abandon Existing Sanitary Sewer.

The abandonment of an existing sanitary sewer will be paid for at the contract unit price for the sizes specified in the proposal which shall be payment in full for furnishing all labor material, equipment, tools, and incidentals necessary, including flow able backfill and end caps to abandon an existing sanitary sewer.

6. Sanitary Sewer Lateral Cleanout.

A sanitary sewer lateral cleanout will be paid for at the contract unit price for the size specified in the proposal which shall be payment in full for furnishing all labor material, equipment, tools, and incidentals necessary including single or double sweep tee, pipe, recessed nut cap, traffic loading cap when required, for a complete sanitary sewer cleanout.

7. Retainer Gland.

Retainer glands will be paid for at the contract unit price which shall be payment for all labor, materials, equipment and incidentals necessary to furnish and install one retainer gland. Retainer Glands may be used in lieu of restrained joint pipe upon which payment will be made for restrained joint pipe, not **retainer glands**.

8. Manhole.

A manhole will be paid for at the contract unit price for the sizes specified in the proposal which shall be payment in full for furnishing, hauling, excavating, backfilling, compacting, **cleaning up**, and for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

9. Manhole Unit.

A manhole unit will be paid for at the contract unit price for the sizes specified in the proposal which shall be payment in full for furnishing, hauling, excavating, foundation preparation, backfilling, compacting, **cleaning up**, and for all materials, equipment, tools, labor, and incidentals necessary to complete the work. The removal and replacement of the manhole cone and frame and cover will be paid for under Manhole Cone Reset.

10. MANHOLE CONE SHAPED TOP SECTION (CONE) RESET.

A manhole cone reset, measured as noted above will be paid for at the contract unit price for Manhole Cone Reset, which shall be payment in full for all material, equipment, tools, labor, and incidentals necessary to complete the work herein specified. The unit price shall include the removal and reinstalling of the existing manhole cone section and manhole frame and cover.

11. MANHOLE FRAME AND COVER RESET.

A manhole frame and cover reset will be paid for at the contract unit price for Manhole Frame and Cover Reset, which shall be payment in full for all material, equipment, tools, labor, and incidentals necessary to complete the work.

12. CONNECTION TO EXISTING MANHOLE.

Connection to existing manhole will be paid for at the contract unit price which shall be payment in full for a manhole pipe connector (boot), all labor material, equipment, tools, and incidentals necessary to connect the new sanitary sewer pipe to an existing manhole.

13. ABANDON EXISTING MANHOLE.

Abandon existing manhole will be paid for at the contract unit price which shall be payment in full for all labor material, equipment, tools, and incidentals necessary including backfill to abandon an existing manhole.

14. MANHOLE DROP CONNECTION.

A manhole drop connection, measured as noted above will be paid for at the contact unit price for the type specified, which shall be payment in full for all pipe, tees, wyes, cleanout stack, materials, equipment, tools, labor, and incidentals necessary to complete the work.

15. AIR AND VACUUM VALVE ASSEMBLY.

An air and vacuum valve assembly will be paid for at the contract unit price for the size specified in the proposal which shall be payment in full for all labor, materials, equipment and incidentals necessary to furnish and install one air and vacuum valve assembly which shall include the box/manhole containing the valve.

16. SANITARY SEWER LIFT STATION.

A sanitary sewer lift station will be paid for at the contract unit price for each lift station specified in the proposal which shall be payment in full for all labor, materials, equipment and incidentals necessary to furnish and install one lift station. This shall include all items within the lift station limits shown on the plans including all piping, valves, valve boxes, pumps, **wet well**, buildings, fencing, grading, and site access when required.

(b) Payment Will Be Made Under Item No.:

- 645-A ___ inch {mm} * Sanitary Sewer ** Pipe Laid (***) - per linear foot {meter}
- 645-B ___ inch {mm} * Sanitary Sewer ** Pipe Relaid (***) - per linear foot {meter}
- 645-C Ductile Iron Fittings - per pound {kg}
- 645-D ___ inch {mm} Retainer Gland - per each
- 645-E ___ inch {mm} **** Stacks and Laterals - per linear foot {meter}
- 645-F Abandon ___ inch {mm} Existing Sanitary Sewer - per linear foot {meter}
- 645-G ___ inch {mm} Sanitary Sewer Lateral Cleanout - per each
- 645-H ___ inch {mm} Manhole - per each
- 645-I ___ inch {mm} Manhole Unit - per each

- 645-J Manhole Cone Reset - per each
- 645-K Manhole Frame and Cover Reset - per each
- 645-L ___ inch {mm} **** Manhole Drop Connection - per linear foot {meter}
- 645-M Connection to Existing Manhole - per each
- 645-N Abandon Existing Manhole - per each
- 645-O ___ inch {mm} Air and Vacuum Valve Assembly - per each
- 645-P Sanitary Sewer Lift Station - per each
- * Show Type of Pipe: Ductile Iron (DI), Polyvinyl Chloride (PVC), High Density Polyethylene (HDPE), High Performance Polypropylene (PP)
- ** Designate One Type: Gravity or Force Main
- *** Designate Restrained Joint if Required
- **** Show Type: Ductile Iron (DI); Polyvinyl Chloride (PVC)

SECTION 853 SANITARY SEWER PIPE, MANHOLES, AND APPURTENANCES

853.01 Ductile Iron Sewer Pipe.

Ductile Iron pipe shall meet the requirements of ANSI/AWWA C 151/A21.51 unless otherwise stated in the project specifications and plans. The pipe shall have an inner cement mortar lining meeting AWWA C 104 and an outer bituminous coating. The push-on joints shall meet the requirements of AWWA C 111. The flanged pipe joints shall meet the requirements of AWWA C 115. Restrained joints shall meet the requirements of AWWA C 110. Lock joint pipe shall meet the requirements of AWWA C 151. The pipe length shall be 18 - 20 feet {5.5 - 6.1 meters}.

853.02 Ductile Iron Fittings.

Ductile Iron fittings shall meet the requirements of AWWA C 110 or AWWA C 151 when approved by the Engineer. Fittings shall have an inner cement mortar lining meeting AWWA C 104 and an outer bituminous coating. The fitting shall have a minimum pressure rating equal to the pipe being installed.

853.03 Polyvinyl Chloride Sewer Pipe (PVC) and Fittings.

Pipe for pressure flow applications shall meet the requirements of ASTM D 2241 for SDR 17 or AWWA C 900 for DR 18 with a minimum cell classification 12454-B as defined in ASTM D 1784. Fittings for pressure flow applications shall be ductile iron meeting the requirements of AWWA C 110. Pipe and fittings for gravity flow applications shall meet the requirements of ASTM D 2665, ASTM D 3034 for SDR 35, or ASTM F949 with a minimum cell classification 12454-B as defined in ASTM D 1784. Marking tape shall be provided for all PVC force mains to allow for locating by location equipment.

853.04 High Density Polyethylene Pipe (HDPE) and Fittings.

HDPE pipe and bends shall meet the requirements of ASTM D 1248, ASTM D 3350 (Grade PE 3408), and ASTM F 714. The HDPE pipe shall have a minimum wall thickness determined by the depth of bury and loading on the pipe.

853.05 High Performance Polypropylene Pipe (PP) and Fittings .

PP pipe and bends shall meet the requirements of AASHTO M330. The PP pipe shall have a minimum wall thickness determined by the depth of bury and loading on the pipe. PP pipe shall be furnished from an approved producer. Approved producers are shown on List I-14, "Producers of High Performance Polypropylene Pipe" in the Department's "Materials, Sources and Devices with Special Acceptance Requirements" manual. Information concerning this list is given in Subarticle 106.01(f).

853.06 Handling and Storage of Pipe.

Pipe shall be handled, transported, delivered, and stored by methods that will not damage the pipe, coatings, or linings. Any pipe damaged or bent will be rejected even though previously inspected and found satisfactory, and shall be replaced or repaired at the Engineer's option, without additional

compensation. Coating or linings scratched shall be repaired in a satisfactory manner with appropriate material.

853.07 Joint Materials for Pipe.

Joint material shall provide a suitable waterproof joint capable of withstanding internal pressure of the system involved and be of an approved type.

853.08 Manholes.

Precast reinforced concrete manholes shall meet the requirements of ASTM C 478. The manhole shall consist of the base, riser, transition, and conical sections and shall have a minimal number of joints. The minimum nominal diameter of manholes shall be 48 inches {1220 mm} for pipe sizes less than 24 inches {600 mm}.

The aggregate shall be calcareous rock. Concrete used to cast manholes shall comprised with Type I/II or Type II cement only. The cone shaped top section shall be either conical or eccentric as required by the project plans and specifications. The top section of manholes less than 6 feet {1.82 m} in depth shall be flat concrete slabs and shall conform to the requirements of ASTM C 478. Basis of acceptance for flat slab tops shall be either proof of design testing or rational design calculations as described in ASTM C 478 and shall be submitted to the Engineer for review. Both cone shaped top sections and flat slab tops shall be designed to withstand a minimum H-20 wheel loading in accordance with AASHTO requirements. A black mastic joint sealer as approved by the Engineer shall be placed on top of the cone section of the manhole before setting the castings to prevent infiltration.

Manholes shall be supplied with pipe cutouts for all incoming and outgoing pipe. The pipe cutouts shall be fitted with flexible manhole pipe connectors (boots) that meet ASTM C 923 and as required by the Engineer.

Cast iron frames and covers shall conform to the Plans in all essentials of design. All castings shall fit the manholes properly. All castings shall be made of clean, even grain, tough gray cast iron. The quality of iron in the castings shall conform to the current ASTM A 48 for Class 30 gray iron castings. Frames and covers shall weigh not less than that shown on the Plans. The castings shall be smooth, true to pattern and free from projections, sand holes or defects and shall properly fit the manhole opening. The portion of the frame and cover which forms the cover seal shall be machined so that no rocking of the cover is possible. The castings shall be coated with coal tar pitch varnish. The cover shall have non-penetrating pick holes. On paved streets, the frame and cover shall be set flush with and in the plane of the paved surface.

Where shown on the plans or directed by the Engineer, sealed castings shall be of the bolted watertight manhole rings and covers and meet the above requirements.

Manhole steps shall be steel rods encased in polypropylene plastic and shall be as approved by the Engineer. Steps may be Type PS-1 or PS-2. Steps shall conform to the requirements of ASTM C 478. Manhole steps shall be driven into the wet wall during manufacture to prevent each from working loose or pulling out.

Manholes shall be constructed in the size, shape, and dimension as detailed in the Utilities Standard Drawings or on the plans.

853.09 Crushed Stone Foundation for Pipe and Manholes.

Crushed Stone shall be screened, washed and 100 percent shall be retained by a 1/4 inch {6 mm} sieve. Crushed stone shall have 100 percent passing a 1 inch {25 mm} sieve and shall be uniformly graded from maximum to minimum size. Foreign matter shall not exceed 3 percent by weight when dry.

853.10 Air and Vacuum Valve.

The air and vacuum valve for sanitary sewer shall permit unrestricted passage of air during filling of the force main and unrestricted entry of air during vacuum of the force main and rated for a minimum of 150 psi {1030 kPa}. The float shall be stainless steel. The valve shall not come into contact with the sewer. The valve shall have a National Pipe Thread (NTP) inlet and shall be fitted with back flushing device. The air and vacuum valve assembly shall be as detailed in the project plans and specifications.