DIVISION 490

SANITARY SEWER SYSTEM CONSTRUCTION

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SECTION 491

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491.1 SCOPE

The work under this section includes the furnishing, installing, laying, jointing, and testing of all sewer lines, manholes, fittings and appurtenances, including necessary service connections required for a complete system as shown on the drawings and specified herein. The work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing sewer operations and modifications as required.

491.2 GENERAL REQUIREMENTS

491.2.1 All work shall be proven to be in first class condition and constructed properly in accordance with the drawings and specifications. All defects and leaks disclosed by tests shall be remedied and re-tested.

491.2.2 The location of existing sewer laterals (active and inactive) are to be considered approximate and have been plotted from the best available records. It shall be the responsibility of the **CONTRACTOR** to field locate all existing laterals.

491.2.2.1 If, upon excavating any sewer lateral a conflict, is found to exist between the proposed construction and an existing or proposed utility (telephone, gas, storm, etc.), the **CONTRACTOR** shall notify the **CITY ENGINEER** and at least 24 hours shall be allowed for remedial action unless otherwise specified by the **CITY ENGINEER**.

491.2.3 Excavation and backfill, seeding and mulching, dewatering, clearing and grubbing, cleanup and other related site work for sanitary sewer construction are specified in GDOT Utility Accommodation Policy and Standards Manual.

491.2.4 All tests and re-tests shall be performed in the presence of the **CITY ENGINEER** or a designated representative. The **CONTRACTOR** shall be responsible for low pressure air testing, structure leak testing, deflection testing, and compaction testing. The **CITY ENGINEER** shall be responsible for lamping. Re-testing and any other additional testing required by this section shall be at the **CONTRACTOR'S** expense.

491.2.5 Sewer mains, services, lift stations, and force mains shall be as-built after construction. As-built drawings for sanitary sewer shall be in accordance with Section 496.

491.2.6 Compaction and density tests are specified in this manual, Section 478, Standard Details 478-6.1A, B, and C, and GDOT Utility Accommodation Policy and Standards Manual.

491.2.7 Contractor shall contact the **UTILITY DEPARTMENT** a minimum of 24 hours prior to connecting to the **CITY** utility system.

491.3 MATERIALS

491.3.1 All materials required by this section, which are necessary for the construction of sanitary sewer mains shall be of the type, model, and manufacture specified under the applicable specifications of Section 499.

491.3.2 Materials not specified herein or under Section 499 shall not be installed in the sanitary sewer system unless specifically authorized, in writing, by the **UTILITY DIRECTOR**. The **CITY** reserves the right to have said materials removed at the **CONTRACTOR'S** expense.

491.3.3 Requests for materials to be approved by the **CITY** shall be made to the **UTILITY DIRECTOR**, in writing, in accordance with set procedures. Copies of the procedure policy may be obtained from the **UTILITY DIRECTOR**.

491.3.4 All materials shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified. They shall have structural properties sufficient to safely sustain or withstand strains and stresses to which they are normally subjected and be true to detail.

491.3.5 All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant, strength designation, and pressure rating. Where ductile iron pipe is to be installed in the system, the words "Epoxy Coated" or "Epoxy Lined" shall be clearly marked on the pipe.

491.3.6 The **CONTRACTOR** shall submit to the **UTILITY DIRECTOR** and **CITY ENGINEER** for approval before work begins, certificates of inspection in triplicate from the pipe manufacturer that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.

491.3.7 The **CONTRACTOR** shall submit to the **UTILITY DIRECTOR** and **CITY ENGINEER** for approval before work begins, certification for pipe linings, in triplicate, shall be furnished by the pipe manufacturer certifying that the pipe lining has been installed in accordance with the specifications set forth herein.

491.3.8 Refer to Section 499 for materials requiring shop drawing submittals.

491.4 MANHOLE INSTALLATION

491.4.1 Bottom of Hole - Keep excavation free of water during the construction process. Build structures to the line and grade shown on the plans. Grade the excavation bottom to provide a smooth, firm and stable foundation underneath the structure. Remove large gravel or cobbles encountered in the excavation bottom from beneath the structure and replace with clean, compacted granule materials to provide uniform support and a firm foundation. Excavate undesirable material to a minimum depth of 12" below the proposed grade and backfill in compacted lifts as specified in these specifications. Place gravel under manholes in wet soil conditions. Manholes are considered confined spaces and the **CONTRACTOR** needs to follow the **OSHA** requirements for confined

spaces entry. Confined space is defined as large enough for a person to work with restricted means of entry and exit. The **CONTRACTOR** is responsible for safety of his/her personnel. The **CONTRACTOR** must use a gas detector to measure the gases present. If no gases are present the structure may be entered. When gases are detected, fresh air must be forced into the area until acceptable levels of air quality are obtained. A tripod/hoist unit shall be set up and manned.

491.4.1.1 At least one foot of rock (57 stone) will be placed under the bottom of the manhole. Additional rock will be added as required by the City inspector.

491.4.2 Installing Sections - Installation of precast manholes shall comply with the manufacturer's recommendations. Precast concrete sections shall be set so the manhole will be vertical and with sections in true alignment. Joint surfaces of the base or previously set section shall have an O-ring installed in the recess or shall be sealed with pre-molded plastic joint sealer equal to "Ramnek"®. If "Ramnek" is used, joints shall be pre-primed and wrapped on the exterior to provide a sealed manhole.

491.4.3 Patching Holes - All holes in sections used for their handling shall be thoroughly plugged with Embeco 167 and 381 Mortar, non-shrinking grout, or approved equal applied and cured in strict conformance with the manufacturer's recommendations so that there will be zero leakage through openings and around pipes. The grout or mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces. As soon as grout or mortar is hydrated to the point where it will not be marred by such application, and within two (2) hours after installation, the **CONTRACTOR** shall apply Master Builders' Master Seal or approved equal membrane curing compound, conforming to ASTM C309-latest, Type 1, Class B, to the finished grout surfaces both inside and outside the manhole. Submission of alternate grouts shall include alternate membrane curing compound or indicate which of the above approved products is proposed for use. This method shall also be applied to the annular space between the wall and entering pipes where new pipes are added to existing structures or where new pipes are repositioned in new manholes. Grout mixed on-site shall be used with potable water and masonry sand from concrete supplier. Dirty pond water and existing excavated sand shall not be used. Entire interior of manhole shall be coated with coal tar epoxy or liner as specified.

491.4.4 Setting Manhole Frames - Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the contract drawings, unless otherwise directed by the **CITY ENGINEER**. Frames shall be set concentric with the manhole base and adjusted to grade as specified in Paragraph 491.4.5 below.

491.4.5 Adjusting Manhole Frames

491.4.5.1 Adjustment of manhole frames due to delayed construction, new grade elevations, manhole rehabilitation or other work requiring adjustment of manhole frame and covers shall be adjusted with brick masonry or precast concrete adjusting rings. Frames shall be adjusted to conform accurately with the specified grade established on the drawings and in accordance with these specifications and Detail 498-1.1. If specified tolerances can not be met, manhole will have to be modified.

491.4.5.2 The **CONTRACTOR** may elect, unless otherwise specified by the **CITY ENGINEER**, to either remove the manhole top completely to facilitate construction or leave in place until the base course is constructed.

491.4.5.2.1 If the manhole is to be left in place until final adjustment, it shall be protected.

491.4.5.2.2 If the **CONTRACTOR** elects to remove the manhole top, he shall place sufficient covering over the manhole, to the satisfaction of the **CITY ENGINEER**, to eliminate infiltration of dirt, limerock, stone, brick, debris, etc, until the top is adjusted to grade.

491.4.5.2.3 In either of the cases above, the **CONTRACTOR** will be responsible for any undesirable material entering the manhole or sewer system as a result of this construction.

491.4.5.3 The **CONTRACTOR** shall prepare the base for the manhole frame to a condition satisfactory to the **CITY ENGINEER**. All loose, broken or cracked brick shall be removed along with excess grout to provide a smooth, solid, level surface to receive the new buildup of the manhole top.

491.4.5.4 Only clean brick shall be used in brick adjustment. If required, the bricks shall be moistened prior to application of the grout or mortar. Each brick shall be laid in a full bed and joint of grout or mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed. Grout shall be one part cement and two parts sand. Lime shall not be used.

491.4.5.5 Outside faces of brick masonry or concrete adjusting rings shall be covered with grout or mortar from 3/8" to 1/2" thick. If required, brick concrete shall be properly moistened prior to application of the grout or mortar. The mortar or grout shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the grout or mortar shall be thoroughly checked for bond and soundness by being tapped. Unbonded or unsound grout or mortar shall be removed and replaced.

491.4.5.6 Frame shall be set concentric with the masonry and in a full bed of grout or mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight.

491.4.5.6.1 The frame shall be completely embedded and sealed to the manhole with grout or mortar. Grout or mortar shall be applied so as to leave no air pockets or voids and shall cover the area from the top of the frame to the outside edge of the manhole.

491.4.6 Installation of manholes over existing mains - Doghouse manholes installed over existing sewer mains must have concrete slabs installed under the existing pipe for the doghouse manhole to sit on. Precast slabs must have keyways to connect walls to slab. Formed-in-place slabs shall be a minimum of 12" and sized by the manhole manufacturer with rebar. Manholes will be sealed on the interior and must be leak tested or vacuum tested as specified for water tightness.

491.4.7 Manhole Test - It is the intent of these specifications that manholes and appurtenance be watertight and free from infiltration, seeping or surface moisture. Water or air tightness of manholes shall be tested at the time the manhole is completed and ready for test. The **CONTRACTOR** shall repair any evidence of leakage. The leakage tests shall be conducted in the following manner:

Water Tightness Test

The **CONTRACTOR** shall plug all inlets and outlets with approved stoppers or plugs. Fill the structure with water to an elevation one foot (1') below ring and cover with a minimum depth of four feet (4'). The water shall stand before the test measurements begin or until the water level stabilizes. If the water level does not stabilize within twenty-four (24) hours, the structure shall be considered to have failed the test. The maximum allowable drop in the water surface is 1/10 of 1% in 24 hours.

Air Tightness Test

The **CONTRACTOR** shall plug all inlets and outlets with approved stoppers or plugs. Air vacuum test shall test manhole from one foot (1') below the ring and cover to bottom of manhole. A vacuum of 1" of mercury shall be drawn on the manhole, let stabilize, time specified in Table WSCM 112 in the Appendix. If a one inch (1") drop or more occurs during the test time, the manhole has failed the test. (See Sewer Pipe Air Test Table for actual test pressure and times.)

Even though the leakage is less than the specified amount, the **CONTRACTOR** shall stop any leaks that may be observed. The manhole will not be accepted until it passes the manhole test.

491.4.8 Flow Channels - Manhole bases shall be formed of Class I concrete while the manholes are under construction. Cut off pipes at inside face of the manhole and construct the invert to the shape and size of the pipe indicated. All inverts shall follow the grades of the pipe entering the manholes. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is targeted to the centerlines of adjoining pipelines. Regardless of differences in entrance and exit elevations, flow channels for all pipes are to be formed to present a smooth transition of flow and shall be subject to the approval of the **CITY ENGINEER**. Flow channels shall be constructed in accordance with Standard Detail 498-1.2B.

491.4.9 Outside Drop Connections - Shall be cast in place using concrete. Pipes shall be held firmly in place while concrete is being formed. Drop connections shall be constructed in accordance with Standard Detail 498-1.2C.

491.4.10 Inside Drop Connections – Shall be placed inside the structure. Pipes should be held firmly in place with steel brackets coated with the same coating used to coat the inside of the manhole. Inside drop connections shall be constructed in accordance with Standard Detail 498-1.2C2.

491.4.11 Stub Lines - Where shown on the drawings, stub lines shall be provided for the connection of future sewer lines. The end of each stub line shall be provided with a bell end which shall be closed by an approved stopper as specified in Section 499. Each stub line shall be accurately referenced. The actual invert elevation of each end of the stub line shall be accurately recorded on the as-built drawings along with the distance from the end of the pipe to the center of the manhole.

491.4.12 Stub Outs - Where shown on the drawings, stub outs shall be provided for the connection of future sewer lines to manholes. Stub outs shall be installed in accordance with Standard Detail 498-1.2D.

491.4.13 Pipes - Connect pipes to new manholes using pipe boots and clamps. Connect pipes to lined manholes after liners have been completed and sealed.

491.5 PIPE INSTALLATION

491.5.1 General - The method of pipe laying shall be subject to the approval of the **CITY ENGINEER**. Each pipe length shall be inspected for cracks. The pipe laying shall proceed upgrade, beginning at the lower end of the sewer, with pipe bell ends upgrade. Extreme care shall be exercised to keep the pipe in exact alignment and elevation. Pipe shall be laid to conform accurately to the lines and grades indicated on the drawings. If approved by the **CITY ENGINEER**, minor changes in the alignment but not the grade will be permitted to avoid underground facilities provided that straight alignment can be maintained between manholes. In no case shall the pipe be walked on, either before or after the joints have been made. Upon discovery, any defective pipe which may have been laid shall be removed and replaced with sound pipe, at no additional cost to the **CITY**. The **CONTRACTOR** shall be responsible for locating all underground utilities in advance of construction to insure that no conflicts occur with the proposed line and grade. If a conflict is found between an existing utility and the proposed grade,

the **CONTRACTOR** is to furnish the **CITY ENGINEER** all pertinent information so that remedial design can be performed. Unless otherwise specified or required by the **CITY ENGINEER**, the bedding and installation shall be Class B. Class B bedding is sand or sandy soil with 100 percent passing the 3/8- inch sieve and no more than 10 percent passing the No. 200 sieve.

491.5.2 Laying and Jointing - The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe. Suitable excavations shall be made to receive the bell of each pipe, which shall be carefully laid true to line and grade.

All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging or blocking up any portion of the pipe. The spigot end of the pipe shall abut against the base of the socket of the adjacent pipe in such a manner that there will be no gaps or unevenness of any kind along the bottom halves of the pipes. Just before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material. The pipe shall be jointed in accordance with the recommendations of the manufacturers of the pipe and gasket. In all jointing operations, the trench must be de-watered when joints are made and kept de-watered until sufficient time has elapsed to assure efficient hardening of the jointing material, or as may be required. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. The **CONTRACTOR** shall take all necessary precautions to prevent flotation of the pipe due to flooding of the trench.

491.5.2.1 Cutting and Beveling PVC Pipe - Cutting of PVC pipe shall be done with either hand or mechanical saws or plastic pipe cutters. Ends shall be cut square and perpendicular to the pipe axis. Spigots shall have burrs removed and ends smoothly beveled by a mechanical beveler or by hand with a rasp or file. Field spigots shall be stop-marked with felt tip marker or wax crayon for the proper length of assembly insertion. The angle and depth of field bevels and length to stop-markers shall be comparable to factory pipe spigot.

491.5.2.2 Bell Holes for Elastomeric Seal Joints - The bell hole shall be no larger than necessary to accomplish proper joint assembly. When the joint has been made, the void under the bell should be filled with bedding or haunching material to provide adequate support to the pipe throughout its entire length.

491.5.2.3 Assembly of Joints - Assemble all joints in accordance with recommendations of the manufacturer. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual jointing resistance is encountered, or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps. Note that fitting bells may permit less insertion depth than pipe bells. (**NOTE:** When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion).

491.5.2.4 Stoppers - Openings such as stubs, wyes, tees, or other services along the lines shall be securely closed by means of an approved stopper that fits into the bell of the pipe and is recommended by the pipe manufacturer. This stopper shall be jointed in such a manner that it may be removed at some future time without injury to the pipe itself. At the close of each day's work, and at other times when pipe is not being laid, the end of the pipe shall be temporarily closed with a close-fitting stopper as specified under Section 499.

491.5.2.5 Cleaning - All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipelines. As the work progresses, the interior of the sewer shall be cleaned of all dirt, jointing material, and superfluous materials of every description. Prior to final inspection, the **CONTRACTOR** shall flush all sewer lines constructed under this contract with clean water to assure complete removal of all debris and foreign materials.

491.5.2.6 Bedding and Backfill - Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement. Where so indicated on the drawings, or where directed by the **CITY ENGINEER**, the pipe shall be supported by compacted granular fill, concrete cradle, or encasement according to the applicable detail shown on the plans. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or precast concrete saddles which shall become part of the completed cradle or encasement. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

491.6 SERVICE CONNECTIONS

491.6.1 Connections - Types of connections shall be as shown on the drawings. Although the general location of connections may be shown on the drawings, the actual location shall be determined by the **CONTRACTOR**, subject to approval by the **UTILITY DIRECTOR**. Service connections shall, if elevations permit, be placed at the most convenient connection point for the building or property served. The **CONTRACTOR** shall make every effort to ascertain this location. Unless authorized by the **UTILITY DIRECTOR** in writing, or shown on the drawings, service connections shall not be tied into new or existing manholes. All service connections shall be terminated at the property line unless otherwise indicated on the drawings or as directed by the **UTILITY DIRECTOR**. In no case shall a service connection stop short of the right-of-way line. It is the intent of these contract documents that every property be provided with at least one service connection and, unless otherwise directed by the **UTILITY DIRECTOR**, the **CONTRACTOR** shall be responsible to see that this intent is fulfilled.

491.6.2 PVC Branch Fittings - Fittings for PVC service branches in new construction shall be molded or fabricated with all gasketed connections. Taps into existing lines shall use a gasketed saddle wye or tee with all stainless steel clamps. Saddles may be mounted on pipe with solvent cement or gasket but shall be secured by metal banding. Install saddles in accordance with manufacturer's recommendations. Holes for saddle connections shall be made by mechanical hole cutters or by keyhole saw or saber saw. Holes for wye saddles shall be laid out with a template and shall be de-burred and carefully beveled where required to provide a smooth hole shaped to conform to the fitting. The **CONTRACTOR** will be permitted use of fittings which are prefabricated using pipe sections, molded saddles and PVC solvent cement, provided the solvent cement is used in fabrications 24 hours prior to installation. Cemented mitered connections without socket reinforcement shall not be permitted. Only PVC primer and solvent cement shall be used in cementing in accordance with the cement manufacturer's recommendations and ASTM D-2855, "Making Solvent- Cemented Joints with PVC pipe and Fittings". Quickly place temporary band clamps both upstream and downstream of the saddle and tighten.

491.6.3 Service Lines - Unless required otherwise by the drawings, service lines from the property line to the collection sewer shall be at a minimum depth of four feet (4') at the property line and shall be laid to straight alignment and uniform slope of not less than 0.6% for six inch (6") pipe. It shall be uniformly compacted backfill. All service lines shall be at least six inches (6") in diameter and referenced in accordance with Paragraph 491.6.5 below.

491.6.4 Pipe Caps and Plugs - All caps and plugs shall be braced, staked, anchored, wired on, or otherwise secured to the pipe to prevent leakage under the maximum anticipated thrust conditions from internal abnormal operating conditions or pressures from water or air.

491.6.5 Referencing Service Connections - All sewer service connections installed shall be referenced in accordance with Standard Detail 498-2.1C.

491.6.6 Recording Service Connections - Each service connection (new or existing) located or installed shall be accurately recorded on "Asbuilt Drawings" as specified under Section 496.

491.7 CONCRETE ENCASEMENT

491.7.1 Provide concrete pipe encasement or special pipe supports as shown on the drawings and as approved by the **CITY ENGINEER**.

491.7.2 Ductile iron pipe may be used in lieu of concrete encasement where water line crosses sewer lines with less than six inches (6”) vertical clearance, with a length of pipe centered at the point of crossing, so as to locate joints at a maximum distance from the water line.

491.8 CONNECTIONS TO EXISTING STRUCTURES

491.8.1 Opening - Where shown on the drawings, new lines shall be connected into existing manholes or structures. Unless stubs of correct size are found to exist, the **CONTRACTOR** shall put suitable openings into the existing structure (wall masonry and floor slab as required) or remove the existing pipe to accommodate the pipelines as indicated on the drawings and as herein specified. The portion of each existing structure removed for new installation shall be confined to the smallest opening possible, consistent with the work to be done, then a pipe boot shall be embedded in the new hole.

491.8.2 Connections - Connections to existing structures with stubouts shall be made by installing an appropriate adaptor as approved by the **CITY ENGINEER**.

491.8.3 Repair - After the pipe is installed, the **CONTRACTOR** shall carefully close up the openings around the pipe to make a watertight joint using "Embeco" No. 167 or No. 381 Mortar as manufactured by the Masters Building Co., or approved equal, and repair the existing manhole invert in a manner satisfactory to the **CITY ENGINEER**. The floor shall be reformed and finished to provide flow channels as specified for new manholes. All such work shall be done with the proper tools and by careful workmen competent to do such work. Entire interior of manhole shall be coated with epoxy. If pipe is a force main, the interior shall be lined with calcium aluminate cementitious coating.

491.9 PIPE ADAPTORS

491.9.1 Where ductile iron pipe is to be joined upstream from vitrified clay pipe, the pipes shall be connected by means of a Fernco joint sleeve or a ductile iron to vitrified clay pipe adaptor as specified under Section 499. Installation shall be in accordance with the manufacturer's recommendations.

491.9.2 Where ductile iron pipe occurs downstream from vitrified clay pipe, the ductile iron bell shall be cut off. The plain ends shall be butted together and connected with a flexible PVC "Coupler" as specified under Section 499. Installation shall be in accordance with manufacturer's recommendations.

491.9.3 The work described by this section shall be considered incidental to the construction and no additional compensation allowed therefore.

491.10 BORING AND JACKING

Where highways, railroads, structures, or other obstacles require that the pipe be bored and jacked, the procedure shall be in conformance with Sections 473 and 474 of this manual.

491.11 PVC EXPANDED-IN-PLACE PIPELINE RECONSTRUCTION

491.11.1 General

This work shall include the furnishing of all labor, equipment, and materials necessary to complete the reconstruction of pipelines as stipulated herein and as shown on the Contract Drawings. The work shall include the preparation of the construction site, including cleaning and flushing of existing piping; flow control bypass pumping; protection of existing conditions during the installation work; unloading; hauling; distributing and installation; testing of all pipe, and other accessories as required for the proper installation.

491.11.2 Intent of Specifications

It is the intent to provide for the reconstruction of existing pipelines by the installation of a high strength PVC expanded in place new pipe. Expansion shall be accomplished by circulating steam, or other approved method and providing pressure to properly expand the PVC pipe tight against the host pipe. After expansion the PVC pipe shall extend over the length of the host pipe from manhole to manhole in a continuous, jointless, tight fitting, watertight pipe-within-a-pipe.

491.11.3 Reference Specifications

ASTM	
D-638	Test Method for Tensile Properties of Plastics
D-696	Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics
D-790	Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D-1784	Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
F-1504	Specification for Folded Poly (Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation

491.11.4 Materials

The PVC pipe shall be fabricated to a size that, when installed, will neatly and tightly fit the internal circumference of the existing pipe. Allowance for longitudinal stretching during insertion shall be made.

The minimum length shall span the distance from inlet to outlet of the respective pipe to be reconstructed. The **CONTRACTOR** shall verify the lengths in the field before starting work.

The minimum thickness for PVC pipe shall conform to ASTM 3034-SDR26.

The PVC compound shall be chemically resistant to withstand exposure to domestic sewage.

The **CONTRACTOR** shall furnish, prior to use of the materials, satisfactory written certification of compliance with the manufacturer's standards and specifications for all materials.

491.11.5 Existing Conditions

Prior to all work, the **CONTRACTOR** shall carefully inspect the area for "present" existing conditions.

The **CONTRACTOR** shall verify all existing pipe diameters prior to ordering pipe materials. In the event of a discrepancy, the **CONTRACTOR** shall immediately notify the **PROJECT ENGINEER**. No work shall be performed in an area of discrepancy until it has been fully resolved by the **PROJECT ENGINEER**.

491.11.6 Shop Drawings and Certifications

After the award of the contract and before any pipe system materials are delivered to the job site, the **CONTRACTOR** shall submit to the **PROJECT ENGINEER** a complete list of all materials proposed to be furnished and installed.

Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical date, and furnish the manufacturer's recommendations as to the method of installation.

Upon approval of the **PROJECT ENGINEER**, the manufacturer's recommendations shall become the basis for acceptance or rejection of actual methods of installation used in the work. No pipe shall be reconstructed without prior notification of the **PROJECT ENGINEER**. Each pipe shall be subject to inspection by the **PROJECT ENGINEER** immediately before it is installed and defective pipe may be rejected.

The **CONTRACTOR** shall submit to the **PROJECT ENGINEER** as part of the shop drawings, the manufacturer's design calculations for the minimum thickness of the pipe materials being supplied.

491.11.7 Construction

The **CONTRACTOR** shall use all means necessary to protect pipe materials before, during, and after installation, and to protect the installed work and materials of all other trades.

The **CONTRACTOR** shall make all required connections to existing pipes and manholes and carry out such work in accordance with local standards and requirements and as directed by the **PROJECT ENGINEER**. Extreme care shall be used to prevent debris from entering existing pipe prior to reconstruction.

In the event of damage caused to materials, the **CONTRACTOR** shall make all repairs and replacement necessary to the approval of the **PROJECT ENGINEER** at no additional cost to the **OWNER**.

The **CONTRACTOR** shall maintain in operating condition all active pipes encountered during the pipeline reconstruction.

The following installation procedures shall be adhered to unless otherwise approved by the **PROJECT ENGINEER**:

491.11.7.1 **Safety** - The **CONTRACTOR** shall carry out all operations in strict accordance with OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving working with hazardous/combustible material (if needed), scaffolding (if required) and entering refined spaced.

491.11.7.2 **Cleaning of Sewer Line** – It shall be the responsibility of the **CONTRACTOR** to remove all internal debris from the pipeline prior to installing the new PVC pipe.

491.11.7.3 **Inspection of Pipelines** – Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by closed circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any condition which may prevent proper installation of the new pipe.

491.11.7.4 **Bypassing Flow** – The **CONTRACTOR**, when required, shall provide for the flow around the section of pipe designated for reconstruction. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. Once the PVC pipe has been pulled into the host pipe, no flow shall be allowed to pass through that section of pipe until the PVC pipe is fully expanded.

491.11.7.5 **Line Obstructions** – It shall be the responsibility of the **CONTRACTOR** to clear the line of obstructions or collapsed pipe that will prevent reconstruction. If inspection reveals an obstruction that cannot be removed by conventional pipe cleaning equipment, then the **CONTRACTOR** shall hydraulically re-round the pipe or make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the **OWNER'S** representative prior to the commencement of the work and shall be considered as a separate pay item.

491.11.7.6 **Installation** – The method of installation shall be compatible with the manufacturer's recommended practices.

The new pipe shall be inserted into the existing pipe through existing manholes, without modification of manholes, other than minor chipping of manhole channels or removing processing equipment.

491.11.7.6.1 **Finish** – The finished liner pipe shall be continuous over the entire length of run between two (2) manholes and be as free as requirements or pressure tests specified.

Any defects which will affect in the foreseeable future or warrant period, the integrity or strength of the new PVC pipe shall be repaired at the **CONTRACTOR'S** expense. Any ribs resulting in the cross sectional area of the pipe shall be removed or the pipe replaced in its entirety unless approved otherwise by the **PROJECT ENGINEER**.

Sealing at Manholes – If, due to broken or offset pipe at the manhole wall, the pipe fails to make a tight seal, the **CONTRACTOR** shall apply a seal at that point. The seal shall be of a resin mixture compatible with the pipe material.

497.11.7.6.2 **Service Connections** – After the pipe has been expanded in place, the **CONTRACTOR** shall reconnect the existing active service connections. The **CONTRACTOR** shall be responsible to confirm the active laterals prior to reconnection. This shall be done without excavation from the interior of the pipeline by means of a television camera and a cutting device that re-establishes the service connections to not less than 90% capacity.

497.11.7.6.3 The **CONTRACTOR** shall restore or replace all removed or damaged paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces or structures in a condition equal to that before the work began, to the satisfaction of the **PROJECT ENGINEER**, and shall furnish all labor and material incidental thereto.

Surplus pipe, tools, and temporary structures shall be removed by the **CONTRACTOR**. All dirt, rubbish, and pipe material from the operation shall be legally disposed of by the **CONTRACTOR.**

491.11.8 Testing

The **CONTRACTOR** shall provide a pipe "coupon" specimen from each run of pipe for testing, after installation, by an approved laboratory. All expenses for the testing of these specimens will be paid for by the **OWNER**. The cost of re-tests made necessary by the failure of the samples of specimens to meet the specified requirements shall be paid for by the **CONTRACTOR**.

As part of the testing requirement, upon completion of the installation, a visual inspection shall be performed of the pipe expanded in place via a closed circuit television camera. A CD or DVD disc of the inspection shall be provided to the **OWNER**.

491.12 CURED-IN-PLACE PIPELINE RECONSTRUCTION

491.12.1 General

It is the intent of this specification to provide for the reconstruction of clay sewer mains by the installation of a resin-impregnated flexible tube which is formed to the original pipe by use of a hydrostatic head. The resin is cured using hot water under hydrostatic pressure within the tube. The Cured-In-Place Pipe (CIPP) will be continuous and tight fitting.

491.12.2 Referenced Documents

This specification references ASTM F1216 (Rehabilitation of pipelines by the inversion and curing of a resin-impregnated tube), ASTM F1743 (Rehabilitation of pipelines by pulled-in-place installation of a cured-in-place thermosetting resin pipe), and ASTM D790 (Test methods for flexural properties of un-reinforced plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

491.12.3 Product, Manufacturer/Installer Qualification Requirements

Since sewer products are intended to have a 50 year design life, and in order to minimize the **OWNER'S** risk, only proven products with substantial successful long term track records will be approved. All trenchless rehabilitation products and installers must meet the requirements in the General Conditions and listed below.

Products and Installers must meet all of the following criteria:

491.12.3.1 For a *Product* to be considered Commercially Proven, a minimum of 400,000 linear feet or 1,000 manhole-to-manhole line sections of successful wastewater collection system installations in the U.S. must be documented to the satisfaction of the **OWNER** to assure commercial viability.

491.12.3.2 For an *Installer* to be considered as Commercially Proven, the Installer must satisfy all insurance, financial, and bonding requirements of the **OWNER**, and must have had at least 5 (five) years active experience in the commercial installation of the product bid. In addition, the Installer must have successfully installed at least 400,000 feet of the product bid in wastewater collection systems. Acceptable documentation of these minimum installations is required.

491.12.3.3 Sewer rehabilitation products submitted for approval must provide *Third Party Test Results* supporting the long-term performance and structural strength of the product and such data shall be satisfactory to the **OWNER**. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without independent third party testing verification.

491.12.3.4 Both the rehabilitation manufacturing and installation processes shall operate under a quality management system, which is third party certified to ISO 9000 or other internationally recognized organization standards. Proof of certification shall be required for approval.

491.12.4 Materials

Tube – The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.

491.12.4.1 The wetout tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.

491.12.4.2 The tube shall be sewn to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.

491.12.4.3 The outside layer of the tube (before wetout) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wetout) procedure.

491.12.4.4 The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.

491.12.4.5 The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

491.12.4.6 Seams in the tube shall be stronger than the unseamed felt.

491.12.4.7 The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed five (5) feet. Such markings shall include the Manufacturers name or identifying symbol. The tubes must be manufactured in the USA.

491.12.5 Resin

The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP which will comply with the structural and chemical resistance requirements of this specification.

491.12.6 Structural Requirements

491.12.6.1 The CIPP shall be designed as per ASTM F1216, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall.

491.12.6.2 **CONTRACTOR** must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D-790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Values in excess of 50% will not be applied unless substantiated by qualified third party test data. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.

491.12.6.3 The Enhancement Factor 'K' to be used in 'Partially Deteriorated' design conditions shall be assigned a value of seven (7). Application of Enhancement (K) Factors in excess of seven (7) shall be substantiated through independent test data.

491.12.6.4 The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occur during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the work.

491.12.6.5 The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

MINIMUM PHYSICAL PROPERTIES

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite (400 k Resin)
Modulus of Elasticity	ASTM D-790 (Short term)	250,000 psi	400,000 psi
Flexural Stress	ASTM D-790	4,500 psi	4,500 psi

491.12.6.6 The required structural CIPP wall thickness shall be as based as a minimum, on the physical properties in Section 5.01.5 and in accordance with the design equations in the appendix of ASTM F1216, and the following design parameters:

Design Safety Factor	=	2.0
Retention Factor for Long-Term Flexural Modulus to be used in design (as determined by Long-Term tests described in paragraph 491.12.6.2)	=	1% - 60%
Ovality*	=	2%
Enhancement Factor, k	=	See Section 5.01.3
Soil Depth (above crown)*	=	3 – 20 ft.
Soil Density **	=	120 pcf
Design Condition (partially or fully deteriorated)***	=	PD

* Denotes information which can be provided here or in inspection video tapes or project construction plans.

** Denotes information required only for fully deteriorated design conditions.

*** Based on review of video logs, conditions of pipeline can be fully or partially deteriorated. (See ASTM F1216 Appendix) The **OWNER** will be sole judge as to pipe conditions and parameters utilized in design.

491.12.6.7 Refer to the attached dimensional ratio table for specific pipe section requirements, based on the pipe condition, depth, ovality, etc. as computed for the conditions shown, using ASTM F1216 design equations.

491.12.6.8 Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

491.12.7 Testing Requirements

497.12.7.1 Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements.

497.12.7.2 Hydraulic Capacity – Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

497.12.7.3 CIPP Field Samples – When requested by the **OWNER**, the **CONTRACTOR** shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in Section 5.01.5 have been achieved in previous field applications. Samples for this project shall be made and tested as described in Section 10.1

491.12.8 Installation Responsibilities for Incidental Items

491.12.8.1 It shall be the responsibility of the **OWNER** to locate and designate all manhole access points open and accessible for the work, and provide rights of access to these points. If a street must be closed to traffic because of the orientation of the sewer, the **CONTRACTOR** shall institute the action necessary to do this for the mutually agreed time period. The **OWNER** shall also provide access to water hydrants for cleaning, inversion and other work items requiring water, **CONTRACTOR** must purchase a meter from the City of Valdosta and provide his/her owner testable backflow preventer after he/she applies for water service at the City Inspections Department.

491.12.8.2 Cleaning of Sewer Lines – The **CONTRACTOR**, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. The **OWNER** shall also provide a dump site for all debris removed from the sewers during the cleaning operation. Unless stated otherwise, it is assumed this site will be at or near the sewage treatment facility to which the debris would have arrived in absence of the cleaning operation. Any hazardous waste material encountered during this project will be considered as a changed condition.

491.12.8.3 Bypassing Sewage – The **CONTRACTOR**, when required, shall provide for the flow of sewage around the section or sections of pipe designated for repair. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. The **OWNER** may require a detail of the bypass plan to be submitted.

491.12.8.4 Inspection of Pipelines – Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by close circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation of CIPP into the pipelines, and it shall be noted so that these conditions can be corrected. A video tape and suitable log shall be kept for later reference by the **OWNER.**

491.12.8.5 Line Obstructions – It shall be the responsibility of the **CONTRACTOR** to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals and obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the inversion process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, then the **CONTRACTOR** shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the **OWNER'S** representative prior to the commencement of the work and shall be considered as a separate pay item.

491.12.8.6 Public Notification – The **CONTRACTOR** shall make every effort to maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be eight (8) hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the **CONTRACTOR** to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The **CONTRACTOR** shall also provide the following:

A. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the **CONTRACTOR** they can call to discuss the project or any problems which could arise.

B. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

491.12.8.7 The **CONTRACTOR** shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP.

491.12.9 Installation

CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:

491.12.9.1 Resin Impregnation – The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To insure thorough resin saturation throughout the length of the felt tube, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction. After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the Installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.

491.12.9.2 Tube Insertion – The wetout tube shall be positioned in the pipeline using either inversion or a pull-in method. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.

491.12.9.3 Temperature gauges shall be placed inside the tube at the invert level of each end to monitor the temperatures during the cure cycle.

491.12.9.4 Curing shall be accomplished by utilizing hot water under hydrostatic pressure in accordance with the manufacturer's recommended cure schedule.

491.12.10 Reinstatement of Branch Connections

It is the intent of these specifications that branch connections to buildings be reopened without excavation, utilizing a remote controlled cutting device, monitored by a video TV camera. The **CONTRACTOR** shall certify he has a minimum of two complete working cutters plus spare key components on the site before each inversion. Unless otherwise directed by the **OWNER** or his authorized representative, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the **CONTRACTOR** will be responsible for all costs and liability associated with such excavation and restoration work.

491.12.11 Inspection

491.12.11.1 CIPP Samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The flexural properties must meet or exceed the values listed in Table 1 of the applicable ASTM.

491.12.11.2 Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87 1/2% of the design thickness as calculated in paragraph 5.01.6 of this document.

491.12.11.3 Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

491.12.12 Clean-Up

Upon acceptance of the installation work and testing, the **CONTRACTOR** shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

491.13 WET WELL AND MANHOLE LINER RECONSTRUCTION

491.13.1 General

This specification defines the approved method and material for the rehabilitation of sanitary sewer manholes and wet wells utilizing a spray applied calcium aluminate cementitious structural rehabilitation system. The purpose is to obtain a dense and durable concrete lining that is resistant to biosulfuric acid attack and meets the strength requirements described in this specification. The work covered in the specifications consists of furnishing all labor, equipment, materials, and supervision necessary to accomplish the rehabilitation as specified.

491.13.2 Contractor's Sequence of Operation

491.13.2.1 Plug all sources of groundwater infiltration and voids in walls;

491.13.2.2 Pressure clean all surfaces with a minimum 2,000 psi water spray;

491.13.2.3 Rehabilitate all interior surfaces including walls, ceilings, and floors in accordance with specification;

491.13.2.4 Cure material applied;

491.13.2.5 Test material applied.

491.13.3 Submittals

491.13.3.1 The **CONTRACTOR** shall furnish detailed and complete data pertaining to the rehabilitation product and installation to the **PROJECT ENGINEER**. Prior to initiating the work, the **CONTRACTOR** shall submit specific technical data with complete physical properties of the product proposed to rehabilitate the structure.

491.13.3.2 Prior to initiating the work, the **CONTRACTOR** shall submit specific technical data with complete physical properties of the product proposed to rehabilitate the structure.

491.13.3.3 A certificate of "Compliance with Specifications" shall be furnished for all materials supplied.

491.13.3.4 A work plan.

491.13.4 Materials

491.13.4.1 Application Material furnished under these specifications shall be a pre-packaged mortar mix, including all cement, aggregates, and any required additives. It is the intent of this specification that the **CONTRACTOR** only be required to add the proper amount of potable water so as to produce concrete suitable for pneumatic application.

491.13.4.2 The chemical composition of the cement portion as well as the aggregates of the mortar mix shall be submitted and approved.

491.13.4.3 The design properties of the mortar mix shall be as follows:

Compressive Strength (ASTM C495)	<5,000 psi	24 hours
	<7,000 psi	28 days
Shrinkage (ASTM C596)	0% when cured @ 95% relative humidity	

491.13.4.4 The mortar mix shall be SewperCoat as manufactured by Lafarge Calcium Aluminates, or Strong-Seal as manufactured by Strong-Seal.

491.13.4.5 Material must have at least five (5) years of successful performance in similar applications and be supplied by an ISO 9002 approved manufacturer.

491.13.4.6 Water used in mixing shall be fresh, clean, potable water, free from injurious amounts of oil, acid, alkali, vegetable, sewage, and/or organic matter.

491.13.4.7 Mortar mix shall be stored with adequate provisions for the prevention of absorption of moisture. It shall be stored in a manner that will permit easy access for inspection and identification of each shipment.

491.13.5 Sampling and Testing

491.13.5.1 Mortar materials used on the project shall be tested by a recognized laboratory or provided to the manufacturer for testing. The testing laboratory shall then test the materials recommended by the **PROJECT ENGINEER** and the manufacturer.

491.13.5.2 The cost of sampling and testing mortar mix during placement shall be borne by the **CONTRACTOR**. Other testing required showing conformance with these specifications shall be the responsibility of the **CONTRACTOR**/material supplier. Certified test reports and certificates, when so directed, shall be submitted in duplicate to the **PROJECT ENGINEER** and to such other agencies or persons as designated by said **PROJECT ENGINEER**.

491.13.5.3 No materials, which fail to meet the requirements of these specifications, shall be incorporated into the work.

491.13.5.4 Before beginning work on the project the **CONTRACTOR** must satisfy the **PROJECT ENGINEER** that the **CONTRACTOR** work crew(s) have done satisfactory work in similar capacities elsewhere for sufficient period of time to be fully qualified to properly perform the work in accordance with the requirements of the related specifications.

491.13.6 Surface Preparation

491.13.6.1 To insure sufficient bond, all surfaces shall be cleaned with a high-pressure water spray or sand blasting (minimum 2,000 psi). Surface shall be thoroughly moistened with water prior to application of shotcrete. In no instance shall shotcrete be applied in an area where running water exists. It is the intent of this specification that the existing surface be saturated.

491.13.6.2 All structures to be lined shall be saturated prior to applying lining material. If saturation does not occur naturally, this can be accomplished by pre-soaking the structure for 24 hours before applying the shotcrete.

491.13.7 Operations

491.13.7.1 Shotcrete shall be thoroughly mixed by machine to insure all large particles are removed before placing into hopper of the mortar gun. Each batch should be entirely discharged before recharging is begun. The mixer shall be cleaned to remove all adherent materials from the mixing vanes and from the drum at regular intervals.

491.13.7.2 The addition of water to the mix shall be in strict accordance with the manufacturer's recommendations.

491.13.7.3 Re-mixing or tempering shall not be permitted. Rebound materials shall not be reused.

491.13.7.4 During progress of the work, where appearance is important, adjacent areas or grounds which may be permanently discolored, stained, or otherwise damaged by dust and rebound, shall be adequately protected and, if contacted, shall be cleaned by early scraping, brushing, or washing as the surroundings permit.

491.13.8 Application of Materials

491.13.8.1 Sequence of application may be from bottom to top or vice versa if rebound is properly removed.

491.13.8.2 Application shall be from an angle as near perpendicular to the surface as practical, with the nozzle held at least one foot (1') from the work (except in confined control). If the flow of material at the nozzle is not uniform and slugs, sand spots, or wet sloughs result, the nozzleman shall direct the nozzle away from the work until the faulty conditions are corrected. Such defects shall be replaced as the work progresses.

491.13.8.3 The time interval between successive layers in sloping, vertical, or overhanging work must be sufficient to allow "tackiness" to develop but not final set. If final set does occur, the surface shall be cleaned to remove the thin film of laitance in order to provide a sufficient bond with succeeding applications.

491.13.8.4 Construction joints within a manhole shall be avoided. In the event a construction joint is necessary and approved by the **PROJECT ENGINEER**, it shall be sloped off to a thin, clean, regular edge, preferably at a 45° slope. Before placing the adjoining work, the slope portion and adjacent applied material shall be thoroughly cleaned as necessary, then moistened and scoured with an air jet.

491.13.8.5 After the body coat has been placed, the surface shall be trued with a thin-edge screed to remove high areas and expose low areas. Low areas shall be properly filled with additional material to insure a true, flat surface.

491.13.8.6 The minimum thickness of the SewperCoat shall be ½" over all surfaces.

491.13.9 Curing

Once the material has been applied and furnished in accordance to the specifications, and it has been determined that the environment is not moist enough for natural curing, the **CONTRACTOR** will be required to apply a curing compound to all coated surfaces. The curing compound used shall meet the requirements of ASTM C309 and have the approval of the shotcrete material manufacturer and the **PROJECT ENGINEER** prior to use.

491.14 INSPECTION AND TESTING

491.14.1 General - All work shall be subject to inspection and testing to detect cracks, open joints, misalignments, infiltration, tightness of the system, dips in the pipe grade, lateral locations or other items the **CITY ENGINEER** may require. Inspections and testing shall include but not be limited to lamping, televising, air pressure testing, deflection testing, or other testing as may be required by the **CITY ENGINEER**.

491.14.2 Sections of sewer main failing to pass any of the above tests shall not be accepted until such defects found by tests and/or inspections are located and corrected and subsequent tests and inspections are made and proven to be acceptable to the **CITY ENGINEER**. Corrections of defects may require the excavation of newly laid sewer mains. Such excavation shall be at the **CONTRACTOR'S** expense with no reimbursement. The **CONTRACTOR** shall take necessary measures, subject to the approval of the **CITY ENGINEER**, to locate and correct defects and shall notify the **CITY ENGINEER** when such defects have been corrected so that re-testing or re-inspection may be performed. Under no circumstance shall asphalt be placed prior to successful completion of all tests and inspections.

491.14.3 The **CONTRACTOR** shall thoroughly clean all sections of pipe to be tested or inspected. The **CONTRACTOR** is warned that if during the inspection process the sewer main is found to contain debris, rocks, sand, concrete or other solid materials, the **CONTRACTOR** shall immediately be required to clean the sewer main and may, at the option of the **CITY ENGINEER**, be required to pay for any costs incurred in re-testing or re-inspection.

491.14.4 Lamping - Lamping shall be performed by the **CITY,** at the **CITY'S** option. Each section of pipe shall show a full circle of light between manholes. Only sewer mains shall be subjected to lamping inspections.

491.14.5 Low Pressure Air Test - Shall be performed by the **CONTRACTOR**. The entire sewer system shall be subjected to a low pressure air test as described by ASTM C828-latest. Piping will be pumped up to 5 - 10 psi for five (5) minutes minimum based on piping size and length. If a one (1) psi drop or more occurs during the test time, the line has failed and will need to be corrected. See Table on Sewer Pipe Air Testing in Appendix for actual testing requirements.

491.14.6 Televising - Televising of sewer mains shall be in accordance with Section 496-3 and performed by the **CONTRACTOR** as deemed necessary by the **UTILITY DIRECTOR**.

491.14.7 Deflection Testing

491.14.7.1 Deflection testing shall be performed by the **CONTRACTOR**. The maximum allowable pipe deflection (reduction in vertical inside diameter) shall be five percent (5%). Such deflection shall be calculated using Table III according to ASTM D-3034 for SDR 35 PVC Pipe. The most common and least expensive method in use is the rigid Go-No-Go device. This device is pulled through the line and measures only a "Go-No-Go" basis.

491.14.7.2 When using a Go-No-Go device to check deflection, several steps should be followed.

1. Make sure the line is clean and free of debris that might cause the device to jam. It is recommended that the line be cleaned with a hydro-cleaner washing in the direction of flow.

2. The next step is to pull a line through the pipe with which to pull the Go-No-Go device. This can be done in several ways:

    a. If a hydro cleaner is being used, attach the pull line to the nozzle end before the actual cleaning cycle starts. As the hose is pulled through the line, it will carry the pull line with it. When the hose nozzle reaches the manhole, disconnect the pull line and tie it off.

    b. A parachute device can be blown through the line with a lightweight string attached. Detach the string, and attach the pull line. Manually drag the pull line through the pipe. Tie off at each manhole.

    c. If a sewer line is in service, a string can be floated through the manhole run. When the string reaches the next manhole, attach it to the pull line and drag through. Tie the pull line at each manhole.

3. Pulling of the gauge will be done by hand or mechanically. The pulling motion should be smooth and easy to avoid jamming the gauge if an obstruction is encountered in the line. The gauge should have a line on each end to facilitate removal should the gauge become obstructed in the direction of pull. If the gauge stops lightly, pull on it to see if it will clear the obstruction. When it appears that the gauge will not go forward, record the distance from the manhole at which point the gauge is stuck and then pull the gauge back out. Do not use mechanical equipment to force the gauge through. This may result in a broken pull line.

TABLE I

PVC sewer pipe minimum wall thicknesses and outside diameter

Nominal Pipe Size, Inches	Minimum Wall Thickness, Inches	Average O. D., Inches	Tolerance on Average, Inches
6	0.180	6.275	0.011
8	0.240	8.400	0.012
10	0.300	10.500	0.015
12	0.360	12.500	0.018
15	0.437	15.600	0.023
18	0.520	18.600	0.026

TABLE III

Base inside diameters and 5% deflection mandrel dimension

Nominal Size, Inches	Average Inside Diameter	Base Inside Diameter*	5% Deflection Mandrel
6	5.764	5.612	5.33 ± .01”
8	7.715	7.488	7.12 ± .01”
10	9.644	9.342	8.87 ± .01”
12	11.480	11.102	10.54 ± .01”
15	14.053	13.586	12.90 ± .01”
18	16.96	16.586	15.76 ± .01”

*Base inside diameter is a minimum pipe inside diameter derived by subtracting a statistical tolerance package from the pipe's average inside diameter. The tolerance package is defined as the square root of the sum of squared standard manufacturing tolerances.

Average inside diameter = average outside diameter - 2(1.06)t
Tolerance package = square root of ("A" square + 2 ("B" square) + "C" square).

Where:

t = minimum wall thickness (Table I).
A = outside diameter tolerance (Table I).
B = excess wall thickness tolerance = 0.06t, and
C = out-of-roundness tolerance.

The values for "C" were derived statistically from field measurement data, and are given as follows for various sizes of pipe:

Nominal Size, Inches	Value for “C”, Inches
6	0.150
8	0.225
10	0.300
12	0.375
15	0.475
18	0.575

4. Deflection testing shall be done prior to any paving operation and before the project is accepted by the **CITY.**

5. Re-rounding of failed sections shall not be allowed. Failed sections must be excavated and replaced to the **CITY’S** satisfaction. In the event pavement is disturbed, only a full-width pavement replacement, extending at least 10' beyond the limits of the excavation, will be allowed.

491.14.8 Manhole Testing - Manholes shall be leak tested as specified in Section 491.4.6.

DIVISION 490

SECTION 492

SANITARY SEWER FORCE MAIN CONSTRUCTION

SECTION 492
SANITARY SEWER FORCE MAIN CONSTRUCTION

492.1 SCOPE

The work under this section includes the furnishing, installing, laying, jointing, and testing of all force mains, fittings, air release valves, plug valves, and appurtenances required for a complete system as shown on the drawings and specified herein. The work shall also include such connections, reconnections, relocations, temporary force mains, temporary pumping, abandonments, and all other provisions in regard to existing force main operations and modifications required to perform the new work.

492.2 GENERAL REQUIREMENTS

492.2.1 All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and specifications. All defects and leaks disclosed by the tests shall be remedied and re-tested.

492.2.2 All tests and re-tests shall be performed in the presence of the **CITY ENGINEER** or a designated representative. The **CONTRACTOR** shall be responsible for hydrostatic pressure testing of the force mains. The **CONTRACTOR** shall be responsible for compaction and density testing. Re-testing and any other additional testing required by this section shall be at the **CONTRACTOR'S** expense.

492.2.3 Compaction and density are specified in this manual, Section 478, Standard Details – 478-6.1A, B, and C, and in GDOT Utility Accommodation Policy and Standards Manual.

492.2.4 Force mains, air release valves, and plug valves shall be asbuilted after construction. Asbuilt drawings for force mains shall be in accordance with Section 486 of this manual except where reference is made to "water main" or "water valve" it shall be interpreted to mean "force main" or "force main valve".

492.2.5 Excavation and backfilling, seeding and mulching, dewatering, clearing and grubbing, cleanup and other related site work for force main construction are specified in GDOT Utility Accommodation Policy and Standards Manual and project specifications.

492.2.6 Unless otherwise specified, force mains shall be installed in accordance with AWWA C-600, latest.

492.2.7 All installed force mains constructed of PVC shall be installed with solid copper locating wire(s) as specified in Paragraph 481.4.7.3 and as shown on Standard Detail 478-7.1A.

492.2.8 Boring and Jacking operations shall be in accordance with Section 474 of this manual.

492.2.9 Where force mains are cresting a hill and air release valves are to be installed, install force main at minimum 48" cover to facilitate proper ARV installation.

492.3 MATERIALS

492.3.1 General

492.3.1.1 All materials required under this section, which are necessary for the construction of force mains, shall be of the type, model and manufacture specified under the applicable specifications of Section 499.

492.3.1.2 Materials not specified herein or under Section 499 shall not be installed in the force main system unless specifically authorized, in writing, by the **UTILITY DIRECTOR**. The **CITY** reserves the right to have said materials removed at the **CONTRACTOR'S** expense.

492.3.1.3 Requests for materials to be approved by the **CITY** shall be made to the **UTILITY DIRECTOR**, in writing, in accordance with set procedures. Copies of the procedure policy may be obtained from the **CITY ENGINEER**.

492.3.1.4 All materials shall be free from defects impairing strength and durability, and be of the best commercial quality for the purpose specified. It shall have structural properties sufficient to safely sustain or withstand strains and stress to which it is normally subjected and be true to detail.

492.3.1.5 The **CONTRACTOR** shall submit to the **CITY ENGINEER** for approval before work begins certificates of inspection in triplicate from the pipe manufacturer that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.

492.4 CONSTRUCTION

492.4.1 Excavation, Trenching and Backfilling shall conform to GDOT Utility Accommodation Policy and Standards Manual and project specifications.

492.4.2 Pipe Installation

492.4.2.1 General - The method of pipe laying shall be subject to the approval of the **CITY ENGINEER**. Each pipe length shall be inspected for cracks. Care shall be exercised to keep the pipe in close alignment and every effort shall be made to avoid creating low or high points in the force main. If approved by the **CITY ENGINEER**, minor changes in alignment may be permitted to avoid underground facilities. Upon discovery, any defective pipe which may have been laid shall be removed and replaced with sound pipe, at no additional cost to the **CITY**. It shall be the **CONTRACTOR** responsibility to locate all underground utilities in advance of construction to insure that no conflicts occur with the proposed alignment and depth. The **CONTRACTOR** is to furnish the **CITY ENGINEER** all pertinent information so that remedial design can be performed. Unless otherwise specified or required by the **CITY ENGINEER**, the bedding and installation shall be Class B. Class B bedding shall be sand or sandy soil with 100% passing the 3/8-inch sieve and no more than 10% passing the No. 200 sieve.

492.4.2.2 Laying and Jointing - The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe. Suitable excavations shall be made to receive the bell of each pipe. The spigot end of the pipe shall abut against the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves. Just before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material. The pipe shall be jointed in accordance with the recommendations of the manufacturer of the pipe and gasket. In all jointing operations, the trench must be de-watered when joints are made and kept de-watered until sufficient time has elapsed to assure sufficient hardening of the jointing material or as may be required. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. The **CONTRACTOR** shall take all necessary precautions to prevent flotation of the pipe due to flooding of the trench.

492.4.2.3 Assembly of Joints - Assemble all joints in accordance with recommendations of the manufacturer. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual jointing resistance is encountered, or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps. Note that fitting bells may permit less insertion depth than pipe bells. (NOTE: When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion).

492.4.2.4 Cleaning - All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipeline. As the work progresses, the interior of the water main shall be cleaned of all dirt, jointing material, and superfluous materials of every description. Prior to final inspection, the **CONTRACTOR** shall flush all water lines constructed under this contract with clean water to assure complete removal of all debris and foreign materials.

492.4.2.5 Bedding and Backfill - Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement. Where so indicated on the drawings, or where directed by the **CITY ENGINEER**, the pipe shall be supported by compacted granular fill, concrete cradle, or encasement according to the applicable detail shown on the plans. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

492.4.2.6 Early Warning Tape - The **CONTRACTOR** shall install early warning tape 12” to 18” above all force mains.

492.4.3 Air Release Valves

492.4.3.1 Provide air release valves in high spots of force mains as shown on the drawings or as directed. If obstructions are encountered during construction that cause a dip and a consequent sharp rise in the force main, then an air release valve shall be installed at the newly created high point upstream from the dip. Payment therefore will be in accordance with the unit price set forth in the proposal.

492.4.3.2 Since it is important that no high points be created other than those absolutely necessary, the **CONTRACTOR** shall lay the force main on uniform grades to permit all air to flow with the sewage to the nearest air discharge point.

492.4.3.3 Two-inch taps into force mains shall be made as per manufacturer's instructions and applicable sections of these specifications, all as approved by the **CITY ENGINEER**. Taps shall be made by using appropriately sized two-inch service clamps and coated with pipe liner repair epoxy.

492.4.4 Installing Valve Boxes

492.4.4.1 All valves shall be fitted with a cast iron valve box and cover. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer. They shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section. Extension sections fabricated by cutting pieces of pipe shall be allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.

492.4.4.2 Valve boxes shall be in vertical alignment and so positioned as to facilitate operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks so as to prevent settlement and to prevent bearing on the valve or the main at any point.

492.4.4.3 Installation of valve boxes shall be in accordance with these specifications and Standard Detail 478-4.1. Install non-pop valve box lids in all asphalt pavement.

492.4.5 Adjusting Valve Boxes

492.4.5.1 All valve boxes which lie within the area of finished construction shall be adjusted to finish grade in accordance with these specifications and Standard Detail 478-4.1.

492.4.5.2 Valve boxes shall be protected during construction in accordance with these specifications. Any valve boxes damaged during construction shall be replaced at the **CONTRACTOR'S** expense. Removal and replacement of the valve box during construction may be authorized provided **CONTRACTOR** insures that sufficient valve ties are available and on site in order to quickly locate the valve.

492.4.5.3 Adjustment of valve boxes shall be subject to the approval of the **UTILITY DIRECTOR**. The **CONTRACTOR** shall maintain vertical alignment and position so as to permit operation of the valve with a standard valve wrench.

492.4.6 Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

492.4.7 Handling and Cutting Pipe

492.4.7.1 The **CONTRACTOR** attention is directed to the fact that cast iron used for pipe and fittings is comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coating.

492.4.7.2 Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

492.4.7.3 In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the **CONTRACTOR** before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12" from the visible limits of the crack. Exposed pipe ends shall be properly sealed as specified in Section 492.4.7.5.1.

492.4.7.4 Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters or knives adapted to the purpose. All cut ends shall be examined for possible cracks caused by cutting.

492.4.7.5 Pipe that has been cut for field fabrication or pipe and fittings with damaged lining shall be field repaired in strict accordance with the manufacturers written instructions. Repair shall be as follows:

492.4.7.5.1 Procedure for Sealing Cut Ends and Repairing Field Damaged Area

1. Remove burrs caused by field cutting of ends or damaged by handling and smooth out the edge of the lining if rough.

2. Remove all traces of oil, grease, asphalt, dust, dirt, etc.

3. Remove damaged lining caused by field cutting operation or handling and clean any exposed metal by sanding or scraping. Sandblasting or power tool cleaning the roughening is also acceptable. It is recommended that any loose lining be removed by chiseling, cutting, or

scraping into well adhered lined area before patching. Be sure to overlap at least one inch (1") of lining in the area to be repaired.

4. With the area to be sealed or repaired absolutely clean and suitably roughened, apply a coat of repair compound specified in the applicators "Certificate of Application" as furnished and approved with the pipe submittal. The **CONTRACTOR** shall apply the repair compound in strict accordance with the manufacturer's written instructions.

492.4.7.6 It is important to coat the entire freshly cut exposed metal surface of cut pipe ends or where the lining has been damaged during handling. It shall be the **CONTRACTOR'S** responsibility to obtain recommended repair compound to make repairs as specified herein.

492.4.7.7 The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the **CONTRACTOR** shall absorb the cost thereof in the unit price specified for fittings or related items.

492.4.8 Sleeve-Type Couplings

492.4.8.1 Sleeve-type couplings shall be stainless steel couplings for plain-end cast iron pipe. The couplings shall be furnished with the pipe stop removed. Couplings shall be provided with plain, Grade 27, rubber gaskets and with stainless steel, track-head bolts with nuts.

492.4.8.2 To ensure correct fitting of pipe and couplings, all sleeve-type couplings, and accessories shall be furnished by the supplier of the pipe.

492.4.9 Setting Appurtenances

492.4.9.1 All valves, fittings and appurtenances needed upon the pipelines shall be set and jointed by the **CONTRACTOR** as indicated on the drawings or as required.

492.4.9.2 Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.

492.4.10 Piping Support and Thrust Blocking

492.4.10.1 The **CONTRACTOR** shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or specified.

492.4.10.2 All bends, tees, and other fittings in pipelines buried in the ground shall be backed with Class I concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then suitable tie rods, clamps, and accessories to brace the fitting properly shall be provided. Such tie-rods, etc., shall be zinc plated or coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.

492.4.10.3 Where buried piping contains fittings which raise or lower the centerline of the pipe, suitable socket clamps and tie rods or restrained joints shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint or wrapped.

492.4.11 Connections to Existing Force Mains

492.4.11.1 Connections to existing force mains shall be where shown on the plans and shall be done as detailed on the plans or as directed by the **CITY ENGINEER**. Connection of new to existing main shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections regardless of how done are subject to the approval of the **CITY ENGINEER** as to method, time and location.

492.4.11.2 Where existing lines are connected to proposed lines, the **CONTRACTOR** shall take appropriate action to insure that the existing lines do not interfere with the pressure testing portions of the work. Failure to do so will not relieve the **CONTRACTOR** of the responsibility of properly pressure-testing the entire system installed. The **CONTRACTOR** shall bear full responsibility for the action or inaction on this matter and shall not claim damages, injuries or additional compensation for said action or inaction.

492.4.11.3 At least 48 hours prior to excavating for the actual connection operation, the **CONTRACTOR** shall excavate and expose the main to be cut out at the proposed location and shall so advise the **PROJECT INSPECTOR** so that the **PROJECT INSPECTOR** may inspect the exposed area and verify, if appropriate, to the **PROJECT ENGINEER** that no conditions are present that would hamper the connection operation. The method of connecting shall be subject to the approval of the **CITY ENGINEER**.

492.4.11.4 Damage caused by sewage from an accidentally cut force main or gravity sewer shall be mitigated by either pumping the sewage back into the gravity sewer system, or cleaned by flushing with either fire hoses or tank trucks. Where practical, the affected area shall be treated with a disinfectant, such as HTH. The CONTRACTOR shall notify the City of Valdosta Utilities Department immediately.

492.4.11.5 The **CONTRACTOR** shall notify the City of Valdosta Utilities Department, at least 48 hours prior to making connections to existing force mains.

492.4.12 Connections to Manholes

Where force mains are to be connected to manholes, the complete interior of the manhole shall be protected. The **CONTRACTOR** shall take upstream measurements necessary to properly install boots, grout pipe openings and thoroughly clean the walls. Apply lining in accordance with Material Specification 499-11-99-06. The application shall be installed in strict accordance with the manufacturer's written instructions.

492.4.13 Cleaning and Flushing

492.4.13.1 Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign matter. This work shall be done with care to avoid damage to any inside coating.

492.4.13.2 All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.

492.4.14 Open Cut Pavement Crossings

492.4.14.1 Bases, Sidewalk, Curb, and Driveway Repairs – The **CONTRACTOR** shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction with minimum standards as established elsewhere in the Contract Documents.

492.4.14.2 Pavement removal and replacement shall be in accordance with GDOT Standard Specifications.

492.5 INSPECTION AND TESTING

492.5.1 General

492.5.1.1 All pipe, fittings, valves, and other items shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.

492.5.1.2 Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.

492.5.2 Field Testing

492.5.2.1 In this section, the terms "piping" and "pipelines" shall include the pipe, fittings, joints, valves, and all other appurtenances necessary for the complete work.

492.5.2.2 Except as otherwise directed, all pipelines shall be tested.

492.5.2.3 All piping to operate under liquid pressure shall be tested in sections of approved length. For these tests, the **CONTRACTOR** shall be furnished clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The **CONTRACTOR** shall furnish suitable pressure gauges, pumps, and measuring tank.

492.5.2.4 Water for testing shall be at the **CONTRACTOR'S** expense unless otherwise specified by the **CITY ENGINEER**. The **CONTRACTOR** shall make suitable arrangements with the City Utilities Department for the monitoring of water consumption and locations to which water may be made available.

492.5.2.5 Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If air release valves or other outlets are not available at high points for releasing air, the **CONTRACTOR** shall make the necessary taps at such points, and shall plug said holes after completion of the test.

492.5.2.6 All force main piping shall be subjected to hydrostatic testing in accordance with Section 481.5.2.6 - "Hydrostatic Testing" of C-600-latest. Pressure tests shall be at 150 psi minimum for a minimum of two hours duration. No pipe installation will be accepted if leakage is greater than the formula or five (5) psi.

492.5.2.7 If the section fails to pass the tests, the **CONTRACTOR** shall do everything necessary to locate, uncover, (even to the extent of uncovering the entire section) and repair or replace the defective pipe, fitting, joint, valve, or other appurtenance.

492.5.2.8 If, in the judgment of the **CITY ENGINEER**, it is impractical to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made as required and approved by the **CITY ENGINEER**; but, in any event, the **CONTRACTOR** shall be responsible for the ultimate tightness of the piping within the above requirements.

492.5.2.9 It is the intent of this section to insure that all parts of the work including but not being limited to pipe, fittings, joints, valves and any other appurtenances are subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the **CITY ENGINEER**.

492.6 ASBUILTS

After all work has been completed on the force main system, the entire project shall be asbuilted in accordance with Section 496. This shall include asbuilts of construction plans and preparation of valve tie sheets.

DIVISION 490

SECTION 493

SANITARY SEWER LIFT STATION CONSTRUCTION

SECTION 493
SANITARY SEWER LIFT STATION CONSTRUCTION

493.1 SCOPE

The work under this section includes the furnishing of all labor, materials, and equipment necessary for the construction of new lift stations and wet wells. Work shall include construction of new wet wells together with all work involved in the installation of new factory built lift stations complete with concrete slab, service panels, electric service, electrical wiring, hose bibbs, water services, pump tests, pipe connections, temporary pumping facilities, and other equipment, materials and work necessary to provide a complete functional lift station. Force main work is specified in Section 492.

493.2 GENERAL REQUIREMENTS

493.2.1 All work shall be proved to be in first class condition and be constructed and installed in accordance with the drawings and specifications. All defects, leaks or equipment malfunctions disclosed by tests shall be remedied. All tests shall be performed by the **CONTRACTOR** and observed by the **CITY ENGINEER**. Water for testing will be furnished by the **CONTRACTOR**.

493.2.2 See Standard Details 498-4.1A and B for "Typical Site Plan" layout for clearing and grubbing and excavation and backfill specifications.

493.2.3 Where lift stations exist and are being replaced or modified as specified herein and on the drawings, the **CONTRACTOR** shall take all measures required, including plugging, temporary pumping, installing temporary screens or basket strainers, or any other work necessary in order to maintain continuous service of the lift station until the modifications or replacement has been completed. The **CONTRACTOR** shall be responsible for any damage to the **CITY**, customers, or to the existing equipment resulting from the temporary measures specified above.

493.2.4 All lift stations are to be a minimum of 2-foot above 100-year flood elevations, existing ground elevations, whichever is greater.

493.3 MATERIALS

493.3.1 All materials required under this section which are necessary for the construction of sanitary sewer lift stations shall be of the type, model and manufacturer specified under the applicable specifications of Section 499.

493.3.2 Materials not specified herein or under Section 499 shall not be installed in the sanitary sewer system unless specifically authorized, in writing, by the **UTILITY DIRECTOR**. The **CITY** reserves the right to have said materials removed at the **CONTRACTOR'S** expense.

493.3.3 Requests for materials to be approved by the **CITY** shall be made to the **UTILITY DIRECTOR**, in writing, in accordance with set procedures. Copies of the procedure policy may be obtained from the **UTILITY DIRECTOR**.

493.3.4 All materials shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

493.4 COATINGS

493.4.1 Concrete Wet Well

493.4.1.1 General - It is the intent of this specification that all interior surfaces of the wet well or exposed steel be covered with a coating as specified in the Contract Documents and as herein specified below. This shall include the annular space formed by the installation of pipes through the wet well wall and the underside of the concrete slab covering the wet well.

493.4.1.2 Surface Preparation - Sandblast according to Specification SSPC-SP-7 ("Brush Off Blast Cleaning") with 60-80 mesh sand and air pressure of 50-60 psi to remove all cement glaze and residue of form release agents and provide a uniform surface profile of approximately one (1) mil. Vacuum clean or air blast surface prior to coating. Apply coating to a dry surface (less than [15%] moisture-free as measured by a moisture meter) only.

493.4.1.3 Coating - Apply approved coatings as specified in Material Specifications 499-02-99-06, 499-11-99-06, 499-11-99-07 and 499-11-99-08. Apply liner and coatings to uniform thickness and in strict accordance with manufacturer's instructions and these requirements. After pre-cast sections have been assembled seal all joints to minimum of six inch (6") overlap at each joint.

493.4.2 Metal, Non-Submerged (Interior & Exterior)

493.4.2.1 General - Paint all exposed steel work, exposed pipe work (except PVC), fittings, and all mechanical equipment with Tnemec 231 coating.

493.4.2.2 Surface Preparation - Clean all metal surfaces according to Specification SSPC-SP6 ("Commercial Blast Cleaning").

493.5 PUMP EQUIPMENT

493.5.1 General - Pumping equipment shall be submersible pumps installed in the wet well. The station shall be complete with all equipment specified herein. The principle items of equipment shall be motor driven sewage pumps, valves, internal piping, control panel with heavy duty circuit breakers, magnetic motor starters, automatic liquid level control system, and internal wiring as specified.

493.5.2 Submittals

493.5.2.1 Shop Drawings - Submit shop drawings and product data for equipment furnished under this Section in accordance with the GENERAL CONDITIONS.

493.5.2.2 Operating and Maintenance Manual - Furnish Operation and Maintenance Manuals in accordance with Section 493.5.16.4.

493.5.2.3 Equipment Installation Certificate - The manufacturer shall provide a written report, through the **CONTRACTOR**, and endorsed in writing by the **CONTRACTOR**, certifying that the equipment has been properly installed, checked and is ready for placement into routine permanent service.

493.5.3 Manufacturer's Start-up Services

493.5.3.1 Furnish services of manufacturer's technical representative to inspect the completed installation, correct or supervise correction of any defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures as described in Section 493.5.16 - Execution.

493.5.4 Unitary Responsibility

In order to unify responsibility for proper operation and service of the pumping station, it is the intent of these specifications that all system components shall be furnished by a single manufacturer for the pump station and for the control panel, or the same (unitary source) for both.

493.5.5 Manufacturer

Approved manufacturers of submersible pumps shall be Gorman-Rupp or Flygt as specified in Material Specification 499-12-99-03.

493.5.8 Submersible Pump Station

493.5.8.1 System Power Characteristics: Electrical power to be furnished to the site will be 3-phase, 60Hz, 4-wire, 480/277 volts, 240/120 volts, or 230/120 volts determined by the power company, maintained within plus or minus ten percent (± 10%). Control voltage shall not exceed 120 volts. Pump station will need to operate at 480/277 volts 3-phase, provide step up transformers to accomplish this. If only single-phase power is available, provide variable frequency drives to convert to three-phase.

493.5.8.2 Pump Station Configuration: Pump station shall be submersible pumps mounted in the wet well with the valves and panel mounted above ground.

493.5.8.3 Pumps

493.5.8.3.1 Description: Pumps shall be submersible sewage pumps, specifically designed for pumping raw, unscreened domestic sanitary sewage.

493.5.8.3.2 Materials: All parts of the pump casing and volute which are exposed to sewage shall be constructed of gray cast iron, ASTM A-48, Class 35-B, with smooth surfaces devoid of blow holes or other irregularities.

493.5.8.3.3 Internal Passages: All openings and internal passages shall be large enough to permit the passage of a sphere three inches (3") in diameter, and any trash or stringy material which may pass through the average house collection system without clogging.

493.5.8.3.4 Automatic Re-Priming: Each pump shall be so designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in a completely open system.

493.5.8.3.5 Metal Surfaces Coating: All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump. Critical mating surfaces, where watertight sealing is required, shall be machined and fitted with Nitrile or Viton rubber o-rings.

493.5.8.3.6 Motor Cable Entry: The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

493.5.8.3.7 Motor Cooling System: On pumps less than 20 hp, motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required. On pumps 20 hp and larger, each unit shall be provided with an adequately designed cooling system utilizing a water jacket. The water jacket shall encircle the stator housing; thus, providing heat dissipation for the motor regardless of the type of installation. Impeller back vanes shall provide the necessary circulation of the cooling liquid through the water jacket. The cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and seal flushing shall also be provided. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104º F. Restrictions below this temperature are not acceptable.

493.5.8.3.8 Pump Mechanical Seals: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two (2) totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper, secondary seal unit, located between the

lubricant chamber and the motor housing, shall contain one (1) stationary tungsten-carbide seal ring and one positively driven rotating tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. Seal lubricant shall be FDA approved, non-toxic.

493.5.8.3.9 Pump Bearings: The pump shaft shall rotate on two (2) bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable. Minimum L_{10} bearing life shall be 50,000 hours at any point along the useable portion of the pump curve at maximum product speed.

493.5.8.3.10 Pump Shaft: Pump and motor shaft shall be the same unit. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable. For pumps under 25 hp, the shaft shall be AISI Type 420 stainless steel. For pumps 25 hp and larger, the shaft shall be C1035 Carbon Steel and shall be completely isolated from the pumped liquid.

493.5.8.3.11 Pump Impeller: The impeller shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

493.5.8.3.12 Pump Wear Rings: A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a nitrile rubber coated steel ring insert that is drive fitted to the volute inlet. On pumps 20 hp and larger, a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller will also be provided.

493.5.8.3.13 Pump Spare Parts: Provide spare top and bottom seals, spare O-ring kit and spare impeller.

493.5.8.3.14 Pump Discharge Piping: Discharge piping shall be equipped with one (1) three quarter (3/4") NPT tapped hole, with ball valve, pressure gauge and saddle.

493.5.8.3.15 Pump Performance Requirements: The pumps furnished shall meet the "Initial Performance Requirements" set forth on the plans. The pump discharge bases and rail systems furnished shall be capable of supporting future pumps which will meet the "Future Performance Requirements" set forth.

493.5.10 Motors and Drive Transmission

493.5.10.1 Pump Motor: The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 180º C (311º F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The stator shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40º C (104º F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125º C (260º F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board shall be heremetically sealed from the motor by an elastomer seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. Wire nuts or crimping type connection devices are not acceptable. The motor and pump shall be designed and assembled by the same manufacturer. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of $\pm$ 10%. The motor shall be designed for operation up to 40º C (104º F) ambient and with a temperature rise not to exceed 80º C. Leakage sensors within the stator housing shall only be supplied if required by the pump manufacturer for warranty purposes. Motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve.

The motors shall be designed for use without overheating in a submerged, partially submerged, or un-submerged condition.

493.5.10.2 Motor Power Cable: The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant rubber. The motor and cable shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 65'. Each pump shall be supplied with a minimum of 40' of power cable.

493.5.11 Valves and Piping

493.5.11.1 Piping: All suction and discharge piping including valves shall be capable of passing three inch (3") spherical solids. Flanged pipe shall be centrifugally cast ductile iron, complying with ANSI/AWWA A21.51/C 115 and Class 53 thickness. Flanges shall be cast iron Class 125 rated and complying with ANSI B16.1.

493.5.11.2 Pump Suction Spool: Each pump shall be equipped with a one-piece, cast iron suction spool, flanged on each end. Each spool shall have one (1) 1 ¼" NPT and ¼" NPT tapped hole with saddle and plugs for mounting of gauges or other instrumentation.

493.5.11.3 Check Valves: Full flow type swing check valves shall have cast iron body with flanged ends rated at 125 lbs. Valves shall be fitted with an external lever and spring. Bronze body ring shall be threaded into the valve port. Valve clapper shall be cast iron, bronze face, and shall swing completely clear of waterway when valve is full open. Hinge pin shall be of 18-8 stainless steel construction and shall be utilized with bronze bushings and O-ring seals. Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valve rating shall be 200 psi water working pressure.

493.5.11.4 Plug Valves: Plug valves shall be of the non-lubricated, tapered type. Valve body shall be semi-steel with flanged end connections drilled to ANSI 125 lb. standard. Valves shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings, and shall have a resilient facing bonded to the sealing surface.

493.5.11.5 Air Release Valve: Each pump shall be equipped with one (1) automatic air release valve, designed to permit the escape of air into the atmosphere during initial priming or unattended re-priming cycles. Upon completion of the priming or re-priming cycle, the valve shall close to prevent re-circulation. Valves shall provide visible indication of valve closure, and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable.

All air release valve parts exposed to sewage shall be constructed of cast iron, stainless steel, PVC, or similar corrosion resistant materials. Diaphragms, if used, shall be of fabric-reinforced neoprene or similar inert material.

A clean out port, three inches (3") or larger in diameter, shall be provided on the air release valve for ease of inspection, clean out, and service. Valves shall be field adjustable for varying discharge heads.

493.5.12 Finish

The pumps, piping, and exposed steel framework shall be cleaned with industrial grade chemical cleaner. The prime coat shall be a zinc base synthetic primer. The finish coat shall be an epoxy grade as specified in Material Specification 499-11-99-04, with color selected by the **UTILITY DIRECTOR**.

493.5.13 Electrical System Panel Components

493.5.13.1 Panel Enclosure: The electrical components and control equipment shall be mounted within NEMA 3R or similar, dead front type control enclosures fabricated of stainless steel. Enclosure doors shall be gasketed with neoprene, hinged, and equipped with captive closing hardware. Control compartments shall incorporate removable back panels on which control components shall be mounted. Back panel shall be secured to enclosures with collar studs.

493.5.13.2 Motor Branch Components: All motor branch components shall be of the highest industrial quality, securely fastened to removable sub-plate with stainless steel screws and lockwashers. The sub-plate shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.

493.5.13.3 Circuit Breaker and Operating Mechanism: A properly sized heavy duty air circuit breaker shall be furnished for each pump motor. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.

A padlocking operation mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the exterior of the control compartment door with interlocks which permit the door to be opened only when circuit breakers are in the OFF position.

493.5.13.4 Motor Starters/Contactors: An open frame, across the line, NEMA rated magnetic motor starter shall be furnished for each pump motor. Starters shall be NEMA size one (1) or above, and shall be designed for addition of at least two auxiliary contacts. Power contacts shall be double-break and made of cadmium oxide silver. All motor starters shall be equipped to provide under voltage release and overload protection on all three-phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position. Siemens Heavy Duty Starters, ESP 100 series.

493.5.13.5 Soft Starters: Solid state soft start starters shall be installed on motors 20 hp or larger.

493.5.13.6 Overload Reset Button: An overload reset push-button shall be mounted through the door of the control panel in such a manner as to permit resetting the overload relays without opening the control panel door.

493.5.13.7 Overload Relays: Temperature compensated, three (3) pole, solid state thermal overload relays shall be of block-type, utilizing melting alloy type spindles, and

shall have visual trip indication with trip-free operation. Overload relays shall be manually reset only, and not be convertible to automatic reset. Trip setting shall be determined by heater element only and not by adjustable settings.

493.5.13.8 Emergency Disconnect Breaker: Provide manual transfer switch breaker to switch to generator power. Provide Russell-Stol generator receptacle sized to main breaker so lift station can be operated by generator. Provisions shall be made to prevent main and emergency breakers from being on at the same time.

493.5.13.9 Circuit Breakers: Circuit breakers shall be properly sized breakers for outlets, lighting, control system, and other uses. Breakers shall be mounted with cutouts through the dead front panel so that breaker faces will be flush with the dead front.

493.5.13.10 Surge Protector: An electronic epoxy encapsulated surge protector shall be provided to protect the control circuitry in the main panel. The protector shall be of solid-state construction with two (2) stages separated by an indicator that will not saturate under full load conditions. The final stage shall utilize a series of high speed silicon avalanche devices. Total response time shall be two (2) nano-seconds or less. A neon indicator shall signal failure.

493.5.13.11 Phase Monitor: A line voltage rate phase sequence and loss monitor shall be provided. The monitor will be pre-wired into the control circuitry to take the station out of service if a phase is reversed, lost, or drops below 83% of normal voltage. The unit shall automatically restore the station to normal conditions when normal power is restored.

493.5.13.12 Warning Light and Horn: The main panel shall be provided with a lexon shielded warning light and weatherproof horn. A silence switch shall be mounted on the front door.

493.5.13.13 Lightning Arrestors: Provide lightning arrestor to protect the control circuitry in the main panel from lightning.

493.5.13.14 GFI Receptacle: A weatherproof duplex ground fault indicating utility receptacle providing 115 volts, 60Hz, single-phase current, shall be mounted on the front of the main panel. Receptacle circuit shall be protected by a 20 ampere thermal-magnetic circuit breaker.

493.5.13.15 Control Circuitry: The control circuit shall be protected by a thermal-magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.

493.5.13.16 Pump Run Indicators: Control panel shall be provided with one pilot light for each pump motor for run, stop, and fault. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is or should be running, stopped, or in fault.

493.5.13.17 Pump Mode Selection: Pump mode selector switches shall be connected to permit manual start and stop of each pump individually, and to select automatic operation of each pump under control of the level control system. Manual operation shall override all shutdown systems, but not the motor overload relays. Selector switches shall be toggle switches meeting Military Standards (MS) for quality. Switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.

493.5.13.18 Elapsed Time Meters: Six (6) digit elapsed time meters (non-reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours".

493.5.13.19 High Pump Temperature Protection: The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature. A thermostat shall be mounted on each pump to detect its temperature, and a signal relay shall be supplied for each thermostat. If the pump temperature should rise to a level which could cause pump damage, the thermostat shall cause the signal relay to drop out the motor starter. An electrical or mechanical indicator, visible on the front of the control panel, shall indicate that the pump motor has been stopped because of a high temperature condition. The pump shall remain locked out until the pump has cooled and the circuit has been manually reset. Automatic reset of such a circuit shall not be acceptable.

493.5.13.20 Wiring: The pump station as furnished by the manufacturer shall be completely wired except for the power feeder lines to the branch circuit breakers and final connections to remote alarm devices. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC).

493.5.13.21 Wire Identification and Sizing: Control circuit wiring inside the panel, with the exception of the internal wiring of individual components, shall be 16 gauge minimum, Type MTW or THW, 600 volts. Wiring in conduit shall be 14 gauge minimum.

493.5.14 Level Control System

493.5.14.1 Description: The level control system shall start and stop the pump motors in response to change in wet well level, as set forth herein.

493.5.14.2 Type: The level control system shall be wet transducer type, a pressure transducer contained in the wet well. Level floats are also required.

493.5.14.3 Sequence of Operation: The electronic controller shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the controller shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start

level". When the liquid is lowered to the "lead pump stop level", the electronic controller shall stop this pump. These actions shall constitute one pumping cycle. Should the wet level continue to rise, the electronic controller shall start the second pump when the liquid level reaches the "lag pump start level" so that both pumps are operating. These levels shall be adjustable as described below.

493.5.14.4 Automatic Pump Alternation: The level control system shall utilize the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.

493.5.14.5 Electronic Controller: The electronic controller shall include integral components to perform all pressure sensing signal conditioning, EMI and RFI suppression, DC power supply and 120V outputs. Comparators shall be solid state, and shall be integrated with other components to perform as described below. Control range shall be 01 to 12.01 of water with an overall repeat accuracy of $\pm$ 0.1 feet of water.

The electronic controller shall consist of the following integral components: pressure sensor, display, electronic comparators, and output relays.

493.5.14.6 Pressure Sensor: The pressure sensor shall be a strain gauge transducer and shall receive and input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or surges. Transducer over-pressure rating shall be three times full scale.

493.5.14.7 Electronic Comparators: Level adjustments shall be electronic comparator setpoints to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable, and accessible to the operator without opening the control panel or any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation, or introduction of pressure to the electronic pressure switch. It shall be possible to change setpoints while the unit is in operation without affecting other setpoints or operation.

493.5.14.8 Output Relays: Each output relay in the electronic pressure switch shall be solid state. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise. The ON state of each relay shall be indicated by illumination of a light emitting diode. The output relay shall be individually fused providing fused overload and short circuit protection. Each output relay shall have an inductive load rating equivalent to one NEMA Size 4 contactor. A pilot relay shall be incorporated for loads greater than a Size 4 contactor.

493.5.14.9 Serviceability: The electronic pressure switch shall be equipped with replaceable plug-in integrated circuits and output fuses. The main circuit board

assembly shall be provided with keyed plug-in connections to "off board" components permitting main board removal without de-soldering. All printed circuits shall have a conformal coating applied to both sides to protect against moisture or fungus.

493.5.14.10 Independent Lag Pump: Circuit design in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.

493.5.14.11 High Water Alarm with Alarm Silencer: The electronic pressure switch shall be equipped with an additional electronic comparator and solid state output relay to alert maintenance personnel to a high liquid level in the wet well. In the event that the wet well liquid reaches a preset high water alarm level, the high water output relay shall energize a signal relay. The signal relay shall complete a 115-volt circuit for an external alarm device. An electrical or mechanical indicator, visible on the front of the control panel, shall indicate that a high wet well level exists. The signal relay shall maintain the alarm signal until the wet level has been lowered and the circuit has been manually reset.

An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay. Located outside of panel on left side as well as on dead front.

493.5.15 Main Disconnect Switch Panel

493.5.15.1 A 316 Stainless Steel NEMA panel shall be provided.

493.5.15.2 Main Disconnect Switch: A main disconnect switch shall be provided, non-fused, sized to handle full service load, 100 amp minimum.

493.5.15.3 Surge Protector: An electronic epoxy encapsulated surge protector shall be provided to protect the secondary line voltage circuitry in the main panel. The protector shall be of solid-state construction with two stages separated by an indicator that will not saturate under full load conditions. The final stage shall utilize a series of high speed silicon avalanche devices. Total response time shall be two (2) nano-seconds or less. A neon indicator shall signal failure. (Install one in main disconnect and one in main panel.)

493.5.15.4 Lightning Arrestors: Provide lightning arrestor to protect the secondary line voltage circuitry in the pump control panel and main feed from lightning. (Install one in main disconnect panel and one in main panel.)

493.5.16 Manufacturer's Responsibility

493.5.16.1 Operational Test: The pumps, motors, and controls shall be given an operational test in accordance with the standards of the Hydraulic Institute. Recordings of

the test shall substantiate the correct performance of the equipment at the design head, capacity, suction lift, speed, and horsepower as herein specified.

493.5.16.2 Support Literature: The manufacturer of the pump station shall be responsible for delivery to the **UTILITY DIRECTOR** five (5) copies of the support literature required herein.

493.5.16.3 Installation Instructions: Installation of the pump station and related appurtenances shall be performed in accordance with written instructions by the manufacturer.

493.5.16.4 Operation and Maintenance Instructions: The pump station manufacturer shall be responsible for supplying written instructions, which shall be sufficiently comprehensive to enable the operator to operate and maintain the pump station and all equipment supplied by the station manufacturer. Instructions shall assume that the operator is familiar with pumps, motors, piping, valves, and controls, but that operator has not previously operated and/or maintained the exact equipment supplied.

The instructions shall be prepared as a system manual applicable solely to the pump station and equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment supplied by them. However, items of equipment for which the station manufacturer has made mounting or other provisions, but which they have not supplied, may be excluded from these instructions.

Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations and pump stations, and which require the operator to selectively read portions of the instructions shall not be acceptable.

493.5.16.5 Manufacturer's Abilities: Upon request of the **UTILITY DIRECTOR**, the pump station manufacturer shall demonstrate proof of financial responsibility with respect to performance and delivery date.

Upon request of the **UTILITY DIRECTOR**, the pump station manufacturer shall provide proof of evidence of facilities, equipment, and skills required to produce the equipment specified herein.

493.5.17 Manufacturer's Warranty

493.5.17.1 The manufacturer of the pump station shall warrant it to be of quality construction, free from defects in material and workmanship. This warranty shall include specific details described below.

493.5.17.2 Enclosure: The pump station enclosure shall be warranted for a period of ten (10) years to be completely resistant to rust, corrosion from moisture, corrosive soils, or physical failures occurring in normal service, without protective

coating, when installation is made according to the manufacturer's recommendations.

493.5.17.3 Overall Pump Station: The equipment, apparatus, and parts furnished shall be warranted for a period of one (1) year, excepting only those items that are normally consumed in service such as light bulbs, oil, grease, etc. The pump station manufacturer shall be solely responsible for the warranty of the station and all components.

Components failing to perform as specified by the **UTILITY DIRECTOR**, or as represented by the manufacturer, or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the **CITY**.

It is not intended that the manufacturer assume liability for consequential damages or contingent liabilities arising out of failure of any product or parts thereof to operate properly, however caused by, or resulting from, or arising out of defects in design or manufacture, delays in delivery, replacement, or otherwise.

493.5.17.4 Effective Date: The warranty shall become effective upon acceptance by the City of Valdosta after successful start-up.

493.5.18 Testing and Training

493.5.18.1 Inspection and Testing: Upon completion of installation, the **CONTRACTOR**, in the presence of the **UTILITY DIRECTOR** and a qualified manufacturer's representative, shall perform a preliminary test on the system to insure the functioning of the station and all component parts as specified herein to the satisfaction of the **UTILITY DIRECTOR**.

493.5.18.2 Approval of the preliminary test by the **UTILITY DIRECTOR** shall not constitute final acceptance of the equipment furnished.

493.5.18.3 After the system is in full operation, a full operating test shall be performed in the presence of the **UTILITY DIRECTOR** and a qualified manufacturer's representative. The **CONTRACTOR** shall furnish all labor, materials, and equipment required for such test and shall correct any deficiencies noted by repairing or replacing the defective component, and re-testing as required until the equipment meets the satisfaction of the **UTILITY DIRECTOR**.

493.5.18.4 Operating personnel shall be trained in operation and maintenance of equipment at start-up. Instruction shall be given in operation, service, adjustments, and routine maintenance. Recommended spare parts lists and maintenance schedules shall be provided.

493.6 WET WELL INSTALLATION

493.6.1 Bottom of Excavated Hole - Keep excavation free of water during the construction process. Build structures to the line and grade shown on the plans. For the wet well, the **CONTRACTOR** shall excavate one foot (1') deeper than the elevation of the bottom of the wet well base and replace the material with suitable bearing rocks or gravel approved by the **CITY ENGINEER**. The bottom shall provide a firm and stable foundation for the structure.

At least one foot (1') of 57 stone shall be placed under the wet well. It is expressly agreed and understood that the **CITY** reserves the right to require additional rock or a compaction test to achieve a stable foundation for the proposed wet well. Compaction tests shall be in accordance with Standard Details 478-5.2A and B.

493.6.2 Installing Sections - Installation of pre-cast wet wells shall comply with the manufacturer's recommendations. Pre-cast concrete sections shall be set so the wet well will be vertical and with sections in true alignment. Joints between pre-cast sections shall be jointed using non-shrink grout as specified below. Wet wells are considered confined spaces and the **CONTRACTOR** must follow the **CITY** requirements for confined space entry.

All holes in sections used for their handling and the annular space between the wall and entering pipe shall be thoroughly plugged and sealed in strict conformance with the manufacturer's recommendations so that there will be zero leakage through openings and around pipes.

After all holes, joints, annular spaces or other exposed areas have been jointed as specified above, the areas shall be sealed in accordance with its manufacturers written instructions with liner material.

493.6.3 Stub Lines - Where shown on the drawings, stub lines shall be provided for the connection of future sewer lines to wet wells. The end of each stub line shall be provided with a bell end which shall be closed by an approved stopper as specified herein. Each stub line shall be accurately referenced to the center of the wet well, and the actual invert elevation of each end of the stub line shall be accurately recorded on the asbuilt drawings.

493.6.4 Wet Well Test - It is the intent of these specifications that wet wells and appurtenances be watertight and free from infiltration. Wet wells shall be free of seeping or surface moisture. The **CONTRACTOR** shall repair any evidence of leakage. Water tightness of the wet well shall be demonstrated by the **CONTRACTOR** by a leakage test which shall be conducted in the following manner:

The **CONTRACTOR** shall fill the structure with water to an elevation one foot (1') below the slab. Plug all inlets and outlets with approved stoppers or plugs. The water shall stand for thirty (30) minutes before the test measurements begin or until the water level stabilizes. If the water level does not stabilize within thirty (30) minutes, the structure shall be considered to have failed the test. The maximum allowable drop in the water surface is 1/10 of one percent (1%) in 24 hours of testing. Even though the

leakage is less than the specified amount, the **CONTRACTOR** shall repair any leaks that may be observed.

493.7 ELECTRICAL

493.7.1 Scope of Work - Furnish all equipment, transportation, tools and labor, unless otherwise specified, to install a complete electrical system with wire, conduit, service panel, emergency hookup, control panel, emergency horn and light, and all other items called for or that can be reasonably inferred from the drawings, including excavation, backfill, placing of conduit, pulling wires, and testing for a complete job ready to operate.

493.7.2 Permits and Inspection - The **CITY** shall make application for electrical service.

493.7.3 Codes and Standards - Nothing in these specifications or on the drawings shall be interpreted as permission or direction to violate any governing code or ordinance. Electrical equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards:

- State and local codes and ordinances and inspecting authorities.
- The National Board of Fire Underwriters.
- National Fire Protection Associate (NFPA)
- Underwriters Laboratories, Inc. (UL)
- National Electrical Manufacturers Association (NEMA)
- American National Standards Institute, Inc. (ANSI)
- Insulated Power Cable Engineers Association (IPCEA)
- Occupational Safety and Health Association (OSHA)

493.7.4 Products - Make equipment of the same type of catalogued product of the same manufacturer. Use weatherproof switches and receptacles with weatherproof covers for outdoor locations or locations subject to moisture intrusion.

493.7.5 Execution - Install all equipment in accordance with approved shop drawings, manufacturer's instructions, and to operate as specified.

493.7.6 Identification - Engrave nameplates, white-on-black laminated plastic, and attach with mounting frames or drive screws. Provide nameplates for all lighting and power panel boards, distribution circuit breakers, receptacles (other than standard convenience), motor control centers, switchboards, disconnect switches, selector switches, push buttons, and other major pieces of electrical equipment.

Provide typewritten circuit directories for each panel board. Color code conductors black, red, and blue for phase wires; white for neutral; and green for ground. Color code control conductors as approved by the **UTILITY DIRECTOR**.

Identify conductor as to load served:

a. Leave all branch circuits tagged in the panel boards, in all gutters, and in all junction boxes where unused circuits terminate for the purpose of identifying the various circuits.

b. Tag feeders and mains in the switchboards.

c. Place identification tags within three inches (3") of the terminal connections at each feeder circuit breaker. Tag with adhesive-type marker.

493.7.7 Service Entrance – All services shall be reviewed on a case by case basis.

493.7.8 Junction and Pull Boxes – Provide NEMA 4X watertight stainless steel enclosures for junction and pull boxes.

493.7.9 Raceway

493.7.9.1 Rigid Aluminum Conduit - Provide rigid aluminum conduit, including bushings, couplings, elbows, and nipples meeting requirements of ANSI C 80.1 and NEC.

493.7.9.2 PVC Schedule 40 Conduit – Provide rigid Schedule 40 PVC conduit for underground burial.

493.7.9.3 Warning Tape – Provide heavy-gauge, yellow plastic tape for use in trenches containing buried conduit. Warning tape shall state "Warning, Buried Electrical."

493.7.9.4 Raceway Schedule –

Minimum Size:	¾"
Exterior:	Aluminum
Underground:	PVC Schedule 40

493.7.10 Conductors

Identify power and control conductors at each termination and in all accessible locations such as handholes, panels, pull boxes, and terminal boxes.

For power conductors provide all single conductors and individual conductors of multi-conductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by wrapping the conductor at each end with vinyl tape.

Use the following colors:

System	Conductor	Color
All	Equipment grounding	Green
120/240 volts, 1-phase, 3-wire	Grounded neutral	White
	One hot leg	Black
	Other hot leg	Red

230/120 volts, 3-phase, 4 wire	Grounded neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
480/277 volts, 3-phase, 4-wire	Grounded neutral	White/black tracer
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

Phase A, B, C, implies the direction of positive phase rotation. Phase rotation shall be counter clockwise beyond first point of entry.

Provide stranded conductors, except provide solid conductors where No. 10 AWG and No. 12 AWG are required in lighting and receptacle circuits.

Utilize only conductors meeting applicable requirements of NEMA WC3, WC5, WC7, and ICEA S-19-81, S-61-402, and S-66-524.

Provide conductors with Type THW or Type THHN/THWN except for sizes No. 6 and larger, provide conductors with XHHW insulation. Provide copper conductors.

493.7.11 Grounding

Ground all exposed metallic parts of electrical equipment, raceway systems, and the neutral of all wiring systems in accordance with the NEC, state, local, and other applicable laws and regulations.

Provide copper-clad steel ground rods not less than ⅝" in diameter, ten foot (10') long, driven full length into earth, six feet (6') apart.

493.7.12 Testing

Test all wiring and connections as required by the **CITY** representative and other authorities having jurisdiction. Correct all failures in a manner satisfactory to the **CITY** representative. The **CONTRACTOR** shall pay all costs of testing, including costs of correcting failures, furnishing all necessary testing equipment and of replacing or repairing any damage to associated work or surrounding area resulting there from and correcting faulty installations. Test resistance to ground by use of a megohm instrument with a maximum resistance to ground of five (5) ohms, and provide additional grounding as required.

Accomplish the following tests for all wire and connections:

a. Continuity
b. Proper grounding
c. Short circuits in system
d. Electrical motor controls

e. Panels with main disconnected from the feeder
f. Sub and branch feeder connections
g. Proper rotation of all motors.

Subject all electrical systems to complete operational tests in accordance with placing the station in operation.

493.8 LIFT STATION INSTALLATION

493.8.1 Installation - The **CONTRACTOR** shall install one submersible automatic lift station. The station shall be complete with all equipment specified herein, factory installed in a fiberglass reinforced polyester resin enclosure or lined per section 499-02-99-06. The equipment shall be installed in strict accordance with the approved shop drawings, manufacturers instruction, and to operate as intended by the manufacturer.

493.8.2 Manufacturer's Representative - The equipment manufacturer for the submersible lift station shall furnish services of a representative approved by the **CITY** to aid and be present during installation, inspect the completed installation, operate the equipment, place the equipment in operation, instruct the **CITY'S** operational personnel in the maintenance of the units, send written notice that the above has been complied with, and the equipment is working in accordance with these specifications.

493.8.3 Test - After the lift station has been installed, the pumps shall be tested for amperage draw and voltage with Total Dynamic Head (TDH) pressure and rate of flow at three (3) points on the pump curve including the design point specified. Rate of flow and head must be within ten percent (10%) and five percent (5%) above design curve respectively for acceptance.

493.8.4 Equipment Installation Certification - A written report shall be submitted to the **UTILITY DIRECTOR** after the lift station has been installed and satisfactory pump tests have been run and all necessary operational features of the lift station are in accordance with the plans and specifications. The report shall certify that equipment has been satisfactorily installed, operated, and test run and that **CITY** personnel have been instructed by the pump manufacturer's representative.

493.9 WET WELL AND MANHOLE ABANDONMENT

Existing wet wells and manholes that are no longer to be used in the sanitary sewer system shall be abandoned. The **CONTRACTOR** shall divert existing sewage flows as called for on the plans and as specified herein. Pipe openings shall be plugged in a manner satisfactory to the **UTILITY DIRECTOR**. Where manholes are to be abandoned, the rim and cover shall be removed and salvaged in accordance with the Special Conditions. Manhole and wet well tops shall be removed and disposed of by the **CONTRACTOR** as specified elsewhere in the specifications. Remove top sections to the elevations shown on the plans. Where no elevation is shown, the manhole or wet well top section shall be removed to the first joint or 24" whichever is greater. The **CONTRACTOR** shall fill and compact the remaining bottom section with select backfill.

493.11 SCADA

Lift Stations shall be furnished with Supervisory Control and Data Acquisition (SCADA) equipment and shown as a part of the construction plans. SCADA shall be furnished and installed by the **CONTRACTOR** under the **CITY'S** direction. Refer to Section 495-2.7 for further requirements.

DIVISION 490

SECTION 495

SANITARY SEWER SYSTEM DESIGN, PROCEDURES AND POLICIES

SECTION 495

SANITARY SEWER SYSTEM DESIGN, PROCEDURES, AND POLICIES

495.1 GENERAL

495.1.1 This section has been provided as a guide for engineers, developers and other users to convey information concerning the **CITY** sanitary sewer system. The information provided hereinafter is general in content but represents the policies, resolutions and ordinances established by the **CITY** with regard to certain criteria the **CITY** feels is necessary in the expansion of its Sanitary Sewer System. Certain items, more particularly specified in other Sections of Division 490 or as provided in official resolutions, ordinances, or policies of the **CITY** shall govern over the guidelines specified herein.

495.1.2 Reference to materials under this section are used in general. Refer to Section 499 for particular sizes, manufacturers, and model numbers.

495.2 DESIGN OF SANITARY SEWER SYSTEM

495.2.1 Sewer Gravity Mains

495.2.1.1 Pipe Sizes

Sewer main pipe diameters shall be 8", 10", 12", 15", 18" or 24". Sewer service laterals shall be six inches (6") in diameter.

495.2.1.2 Pipe Slopes

Sewer mains and laterals shall be designed and constructed so they conform to the following minimum pipe slopes.

Diameter	Min. Slope (%)
6"	0.6
8"	0.4
10"	0.30
12"	0.24
15"	0.18
18"	0.14
24"	0.10

If the system does not meet minimum slope, the system will not be accepted by the **CITY** until corrected. Systems need to be designed above these requirements to allow for field installation deviations.

Maximum slope of sewer mains shall be designed to limit sewage flows to eight feet (8') per second, or less.

495.2.1.3 Type of Pipe

495.2.1.3.1 Sewer mains shall be constructed of PVC except as specified in Section 495.2.1.3.2.

495.2.1.3.2 D.I.P. shall be installed where sewer mains fall under any of the following installations:

a. Cover over sewer main is less than 48".

b. Where vertical or horizontal separation between water mains and storm sewer mains cannot be met.

495.2.1.4 Location

495.2.1.4.1 Sewer mains shall be constructed in the center of rights-of- way and easements.

495.2.1.4.2 Sewer mains and manholes constructed in easements shall be installed in a 20' minimum utility easement.

495.2.1.4.3 No permanent structures shall be constructed within ten (10) ft. of the edge of a permanent easement on front or rear setbacks or within two (2) ft. on side setbacks.

495.2.1.5 Depth

495.2.1.5.1 PVC sewer mains shall maintain a minimum cover of forty-eight inches (48"). The depth of cover shall be measured from the top of PVC sewer main to the finished grade directly above the pipe or from the top of the pipe to the centerline of the roadway, whichever is greater.

495.2.1.5.2 Minimum clearance between sewer mains and water mains shall be ten foot (10' preferred) six foot (6') minimum, horizontally or 12" (preferred), six inches (6") minimum, vertically. Where the minimum standard cannot be met for horizontal separation, or vertical separation, the sewer main crossing shall be constructed of ductile iron pipe so that one (1) joint of pipe is centered under the water main or encased in concrete to a minimum of ten feet (10') to either side of the water main.

495.2.1.5.3 Sewer mains shall not exceed fifteen feet (18') in depth unless approval is made by the **CITY ENGINEER** and the **UTILITY DIRECTOR**.

495.2.2 Sewer Manholes

495.2.2.1 Maximum spacing between sewer manholes shall be four hundred feet (400'). Provide manholes where changes in slope or alignment occur.

495.2.2.2 Manhole depths from 0' to 12' shall be constructed using 24" ring covers. Manholes in excess of 12' shall use 32" diameter ring covers.

495.2.2.3 Where the depth of manhole from the top of ring to the invert of effluent main is less than 48", a flat top manhole shall be used.

495.2.2.4 Drop connections shall be provided where the difference in elevation between the incoming sewer and the manhole invert is 30" or greater.

495.2.2.5 The minimum diameter of manholes shall be 48".

495.2.2.6 All manholes shall be lined on the inside with a material in section 499.11.99.08.

495.2.2.7 Pipes entering manholes in line with flow channel shall be 0.1' minimum above the effluent invert, not to exceed 30" without a drop connection. Pipes entering manholes not in line with flow channel shall be 0.2′ minimum above the effluent invert.

495.2.2.8 Total depth of manholes shall not exceed 18' in depth unless approved by the **UTILITY DIRECTOR**.

495.2.2.9 All new connections to existing manholes shall be done by coring the opening and installing a boot for the pipe to connect to. Reconstruct flow channel as required.

495.2.2.10 Manholes located below the 100-year flood elevation will have a bolt-down, water tight rings and covers pre-cast into the manhole cone.

495.2.2.11 All manhole adjusting rings used on manholes in the street will be brick or precast adjusting rings.

495.2.3 Service Laterals

495.2.3.1 Sewer service laterals shall be centered in lots and shall be one (1) service lateral for each property.

495.2.3.2 Laterals shall be deep enough to serve the lowest point on the property being served, using minimum slopes established by the Southern Standard Plumbing Code. Minimum depth at the property line shall be four feet (4').

495.2.3.3 Minimum size of service laterals shall be six inches (6").

495.2.3.4 All laterals shall be installed perpendicular to main except dead end manhole connections where lateral length is limited to a maximum of 75'.

495.2.3.5 When connecting to laterals, a clean-out shall be installed at the property line as detailed in Section 498-2.2B.

495.2.3.6 All laterals shall be installed straight without bends from the main to the property line, except for the wye and 45º bend connecting to the main.

495.2.3.7 New service connections to existing sewer mains shall be installed in accordance to Detail 498-.1A.

495.2.4 Force Mains

495.2.4.1 City maintained force main pipe diameters shall be 4", 6", 8", 12", 18", 20", or 24". Other size pipe diameters shall not be allowed except that where new mains are to be connected to existing mains which are of a lesser diameter.

495.2.4.2 Privately maintained force main pipe line diameters shall be 1", 2", 3", 4" 6", 8", 12", 18", 20", or 24".

495.2.4.3 Four inch (4") to twenty four inch (24") sewer force mains shall be polyvinylchloride (PVC), ductile iron pipe (DIP), OR High Density Polyethylene (HDPE) based on pressure. All PVC pipe shall be sewer green with locating wire(s).

495.2.4.4 Sizing of sewer force mains shall be in accordance with sound engineering practices and the City of Valdosta Water and Sewer System Master Plan.

495.2.4.5 Air release valves shall be installed at all high points in the force main. Force main to be installed with a minimum 48" cover to facilitate proper ARV installation.

495.2.4.6 Force mains shall be designed to maintain a minimum velocity of two (2) FPS and shall not exceed eight (8) FPS.

495.2.4.7 Force mains shall be constructed eight feet (8') off the right of way. For projects where a new road is being constructed parallel with the force main location, the force main may be installed under the pavement at a depth of 48".

495.2.4.8 PVC force main pipe shall meet requirements of ANSI/AWWA C-900, DR 14 and DR 18 for sizes four inch (4") through 12"; C-905, DR18 for sizes 14" through 36".

495.2.4.9 Fittings shall be DIP fittings for DIP and PVC pipe installations. Mega-lugs or concrete thrust block can be used on DIP pipe and on PVC pipes. Mega-Lugs on PVC have to be non-penetrating mega lugs, specifically designed for PVC.

495.2.4.10 For PVC force mains, DIP tees and valves will be installed at any potential future connection points where the future connection is six inch (6") or larger in diameter.

495.2.4.11 Taps are not allowed on sewer force mains. Wyes will have to be cut in when connections to existing force mains are approved by **UTILITY DIRECTOR**.

495.2.4.12 Locating wire(s) will be installed on all PVC and HDPE force mains.

495.2.4.13 Provide design calculations showing the pressures designed for the forcemain system. The working pressures within the system shall not exceed the pressure class of the pipe with a 1.5 safety factor. PVC C-900, DR-14 is rated at 305 psi, PVC C-900, DR-18 is rated at 235 psi.

495.2.4.14 Where new force mains are to be connected to existing City manholes the interior of the manhole shall be relined with a material listed in section 499.11.99.08.

495.2.4.15 Where new force mains are to be connected to existing City manholes the manhole shall be cored with a boot installed. The inside of the manhole shall be lined to the satisfaction of the **UTILITY DIRECTOR**. The existing flow channel shall be reconstructed to properly handle the new influent flow.

495.2.4.16 Force mains shall connect to manholes near the manhole bottom and in such a manner so as to provide maximum direction into the effluent pipe, between 90 and 180 degrees, 180 degrees preferred.

495.2.5 Lift Stations

495.2.5.1 Lift stations shall be submersible as specified in Section 498-4. Submersible pump stations are more desirable lift stations

495.2.5.2 Provide a ⅝" x ¾" water service and meter. Meter box shall be located at the property line.

495.2.5.3 Provide a 50' x 50' lift station site, minimum unless otherwise approved by the **UTILITY DIRECTOR.**

495.2.5.4 Access to the lift station shall be provided by a twelve foot (12') wide concrete driveway. Driveway shall be six inches (6") minimum over compacted subgrade 98% of modified proctor. Concrete driveways shall be eight inches (6") thick with re-bar reinforcement, #4 @ twelve inches (12") each way, minimum.

495.2.5.5 Chain link fencing around the lift station site is required with #57 stone 4-inches deep inside fence, so there is no grass to maintain. Fabric under rock.

495.2.5.6 Provide a lift station site plan showing the location of the wet well and pump station, electric service, water service, driveway apron, and relativity of connecting pipes which include gravity sewers and force main. See Standard Details 498-4.1A and B for "Typical Site Plan" layout.

495.2.5.7 Electrical service to the lift station shall be underground from an electric pole located along the right of way line. Voltage shall be 277/480 or 240/120 volts. Developer will need to pay for electric until lift station has been accepted by the **CITY**, all punch list items have been completed, and all submittals and asbuilts received. If only single-phase power is available, provide variable frequency drives to convert to three-phase.

495.2.5.8 Wet Wells

495.2.5.8.1 Only one (1) influent invert shall be installed into wet well. Provide a junction manhole upstream from the wet well. Junction manhole must be lined as specified in Material Specification 499-11-99-06.

495.2.5.8.2 City maintained wet wells shall be concrete and lined as specified in Material Specification 499-11-99-08.

495.2.5.8.3 Fiberglass wet wells will not be accepted as stand alone privately maintained systems. Fiberglass wet wells must be installed with a reinforced concrete slab and concrete walls for structural support.

495.2.5.8.4 City maintained wet well shall have nominal inside diameters of either 6', 8', 10', or 12'. Minimum wall thickness shall be eight inches (8"), as specified in Material Specification 499-02-99-02, 499-02-99-07 or 499-02-99-20.

495.2.5.8.5 Maximum depth of wetwells shall be 20′ unless otherwise approved by the **UTILITY DIRECTOR**.

495.2.6 Level Controls

495.2.6.1 Provide a minimum of forty eight inches (48″) between the bottom of the wet well and the elevation for both pumps to be turned off (low liquid level).

495.2.6.2 Provide minimum 24" between the elevation for both pumps off and the elevation for the first pump to come on.

495.2.6.3 Provide 12" between the elevation for the first pump to come on and the elevation for the second pump, or lag pump, to come on.

495.2.6.4 Provide 12" between the elevation for the second pump to come on and the elevation of the lowest influent pipe invert.

495.2.6.5 Provide 12" between the influent pipe invert and the high level alarm or as directed by the **UTILITY DIRECTOR**.

495.2.7 <u>SCADA- City Maintained Lift Stations</u>

495.2.7.1 Provide for Supervisory Control and Data Acquisition (SCADA). All lift stations shall be installed with a SCADA system. System shall be installed by the **CONTRACTOR** with the lift station. Installation of the SCADA system shall be required for final acceptance of the lift station.

495.2.7.2 SCADA systems will be installed before the lift station is on-line and functional. The **DEVELOPER** must do a radio survey to determine height of the antennae required. Coordination with the Utility Department shall be made for the radio survey and the installation of the SCADA system.

495.2.8 Site Plans

The following information and data must be provided on all site plans in order to obtain approval.

495.2.8.1 Provide an individual plan drawing titled "Utility Plan". The Utility Plan should adhere to or show the following requirements as applicable.

495.2.8.2 All water and sanitary sewer construction shall be in accordance with the latest edition of the Volume I, City of Valdosta Standard Specifications for Water and Sanitary Sewer Construction. A note shall be placed on the plan accordingly.

495.2.8.3 The location of all existing and proposed sewer mains, manholes and sewer services relative to this site are to be shown.

495.2.8.4 City will maintain all sewer mains eight inch (8″) diameter and above that include manholes both onsite and offsite. Sewer services and cleanouts will be maintained by the City when they are located within City easements or the City Right-of-way. A note shall be placed on plans accordingly.

495.2.8.5 Sewer system asbuilt to be submitted to **UTILITY DIRECTOR** prior to issuance of Certificate of Occupancy (CO). Asbuilt to be in accordance with Section 496.

495.2.8.6 If the site is connecting to an existing sewer service the sewer service should be shown in its correct location. Also show location of all existing sewer services relative to the site.

495.2.8.7 Show manhole locations on both sides of sewer service locations.

495.2.8.8 Show rim and inverts of all sewer manholes relative to this site.

495.2.8.9 Show the distance between manholes.

495.2.8.10 Show distance from the downstream manhole to the sewer service.

495.2.8.11 Show diameter of all sewer mains.

495.2.8.12 Existing sewer services that are to be connected to should be verified as to existence, location and elevation. Show date sewer service was excavated and verified along with invert elevation and ground elevation on the plans.

495.2.8.13 If no sewer service is available and the site is to connect to a City sewer main show the distance from the downstream manhole to the new service location.

495.2.8.14 If a new sewer service is to connect to an existing manhole show the connection to be made by "coring" the manhole and installing a boot.

495.2.8.15 If a new sewer service is to connect to an existing manhole show the manhole rim and invert elevations as well as the new invert in bold.

495.2.8.16 If a new service is to connect to an existing manhole provide a note that the manhole flow channels are to be reconstructed as required by the **UTILITY DIRECTOR.**

495.2.8.18 Show the diameter, pipe material and slope of the new sewer service pipes.

495.2.8.19 If verification of the sewer service is to be postponed until site excavation a note must be put on the cover sheet as follows:

"By approval of this site plan the developer hereby acknowledges that the location and elevation of the City's sewer service has not been verified and hereby accepts full responsibility for any costs or delays incurred in the location, installation or connection thereto. The owner further understands that any service locations provided by the City are from the best available records and that the City in no case will be held liable for any consequences resulting from the service being at the wrong elevation or not being where specified including any delays to remedy the situation. The owner further agrees to excavate the service prior to any construction on the site and to provide the City Utility Department (229) 259-3592 with the actual location and elevation of

the service, relative to the downstream manhole."

_____

Acknowledgement Signature of the site developer

495.2.8.20 A cleanout must be shown at the property line for all sewer service connections.

495.2.8.21 If the site has an existing structure and the structure is connected to City sewer there must be a cleanout at the property line. If the sewer service does not have a cleanout, provide one at the property line.

495.2.8.22 All existing sanitary sewer manhole covers that fall in areas of new construction are to be adjusted to the new surrounding grade. Add note if applicable.

495.2.8.23 If the site has a private lift station and the force main is to connect to a City manhole show the inside of the manhole to be relined with a material from specification 299-11-99-08.

495.2.8.24 All sewer mains will require an asbuilt drawing. The drawing shall show the location of all sewer mains, manholes and services. Asbuilt drawing shall be in accordance with Section 496, Volume I, City of Valdosta Standard Specifications for Water and Sanitary Sewer Construction. A note should be placed on the plans accordingly.

495.2.8.25 All City maintained sewer mains and manholes will require an easement to be provided prior to obtaining a Certificate of Occupancy (CO). Add a note to the pans accordingly. Minimum width of easement shall be 20′.

495.2.8.26 When landscaping is to be installed no large trees can be installed over sewer mains.

495.2.8.27 Indicate number of stories and units for all buildings.

495.3 PROCEDURES

495.3.1 Locating Laterals

495.3.1.1 Locations of sanitary sewer laterals can be obtained from the office of the **UTILITY DIRECTOR** either in person or by telephoning (229) 259-3592. Distances will be provided from the downstream manhole to the lateral location from asbuilt drawings. When inquiring to obtain lateral locations, one or more of the following must be provided:

A) physical address of the property
B) parcel account number as assigned by the Lowndes County Property Appraiser's office
C) copy of the deed to the property or authorized legal document such as a boundary survey or site plan.

495.3.1.2 Where locations given are proven to be inaccurate, due to inaccurate asbuilts, and after a reasonable effort to locate the lateral, the **UTILITY DIRECTOR** shall be notified. A reasonable effort shall be defined as excavating a minimum distance of ten feet (10') either side of the location provided and to a depth equal to the elevation of the sewer main. If the **UTILITY DIRECTOR** ascertains that a reasonable effort has been made, he will issue a work order to the City Utility Department to locate or provide a service lateral. Should a work order be necessary, sufficient time shall be allowed to locate the lateral. Generally a minimum of 48 hours is required to locate a lateral by excavation.

495.3.1.3 If no lateral has been provided to a property and the property is located within an annexed island, a new lateral will be installed at no cost to the property owner. If an additional lateral to a property is requested where at least one (1) lateral has already been provided, the total cost of the lateral installation, shall be borne by the property owner. Requests for lateral locations shall be made in writing to the **UTILITY DIRECTOR**. A written estimate of the installation cost will be provided. If the lateral is requested to be installed, a check in the amount of the estimate shall be delivered to the **UTILITY DIRECTOR** prior to installation of the lateral. Upon completion of the installation, the requestor shall pay any difference between the actual and the estimated cost of the installation or will be reimbursed the difference should the actual installation cost be less than the estimated cost.

495.3.2 Lateral Stoppages

495.3.2.1 Where lateral sewer services are suspected to be stopped up, the following procedure must be adhered to before notifying the City Utility Department to clear the stoppage. The plumber shall insert a sewer tape (snake) into the customer's sewer line to unstop the blockage. If the plumber cannot unstop the sewer line and feels that an adequate amount of tape inserted to be into the right of way, they shall call the City Utility Department at (229) 259-3592. At this time, the plumber is to request verification from the Utility Department personnel of that fact. If it is agreed to be a **CITY** problem by this

means, the plumber's work shall be terminated. At this point, he will be entitled to submit a reasonable bill to the Utility Department for reimbursement. The **CITY** will then excavate if necessary and make the appropriate repairs. If, following excavation, it is discovered that the problem is the customer's, the customer will be required to recall the plumber and the full bill will be the customer's responsibility.

495.3.2.2 If the stoppage is at the property line and appears it is the connection to the lateral (doughnut) it will be considered the customer's problem, and the excavation will be done by the plumber. If at all possible, the **CITY'S** representative will remain on site to witness the excavation and verify the findings. If roots are the problem, and it is determined the problem originated from this connection, the **CITY** will make the repairs to its lateral but not reimburse any monies for the excavation.

495.3.2.3 As an alternate method of determining stoppage responsibility, the owner or plumber shall excavate the lateral at the property line and make a hole in the pipe. If the pipe is full at this point, the owner or plumber shall call the City Utility Department as specified above. If the pipe is not full the owner or plumber shall resolve the situation and repair the pipe. Should the pipe be stopped up the bill should be handled as specified in this section.

495.4 POLICIES

495.4.1 Extending City Sewers

495.4.1.1 The **CITY** has developed a master plan for the extension of the sanitary sewer system. Any extensions, either constructed by the **CITY** or by private developer, shall adhere to the plan.

495.4.1.2 Annually, the **CITY** budgets for extending sewers throughout the **CITY**. The extensions stem from written requests to extend sewer and from the **CITY'S** master plan providing for a chronological method of extending the **CITY'S** sewer system annually.

495.4.1.3 The **CITY** will require that any land or development receiving sanitary sewer services from the **CITY** will annex into the **CITY** if or when it is contiguous to the **CITY**. A "Petition for Annexation" must be executed prior to the **CITY** authorizing the connection.

495.4.1.4 All new residential and commercial structures in the **CITY** shall be required to connect to the **CITY'S** sanitary sewer system if available within 200-feet.

495.4.1.5 When an existing on-site sewage disposal system (septic tank and drain field) for development fails to function properly or requires pumping, it shall be abandoned and the structure connected to the sewer system if service available 200-feet.

495.4.1.6 New or replacement septic systems will not be permitted if sewer service is available within 200-feet of the development.

495.4.1.7 Where sewer is required to be extended in order for a development to adhere to the policies set forth herein, it is the policy of the **CITY** that the applicant requiring the extension provide a request to the office of the **UTILITY DIRECTOR** for the extension. Requests to extend the **CITY'S** sewers must be in the form of either a written request or by a developers' agreement. Written requests shall contain the following information:

A) Owner of the property
B) Owner's address
C) Property Appraiser's tax number
D) Sketch, plan, or map showing the location of the property
E) Legal description of the property

Contact the City of Valdosta Utility Department at (229) 259-3592 for more information concerning developers' agreements.

495.4.1.8 All extensions shall be in accordance with the requirements and specifications of this manual. The cost of the extension shall include but not be limited to administration, engineering, surveying, inspection, testing permitting, pipes, manholes, appurtenances, construction, financing, and other costs relating to the construction of the extension. The extension shall be designed in accordance with the provisions of this section.

495.4.1.9 Except for those extensions where the applicants' connection charge exceeds the estimated construction cost or for those extensions authorized by the City Manager under Paragraph 495.3.1.1 all extensions must be approved by City Council.

495.4.1.10 No extension will be made outside the **CITY** limits unless the applicant agrees to annex all property to be served or, if the applicant's property is not annexable, agrees by appropriate document to annex into the **CITY** upon the property becoming annexable. If the applicant cannot annex into the **CITY**, all costs of the extension shall be borne by the applicant.

495.4.1.11 When estimating the construction cost of the extension, the length considered shall be the lesser of the distances from the end of the existing sewer main to the

farthest point of the applicant's property or to the termination point consistent with good engineering practice.

495.4.1.12 In cases where individual sewage disposal systems (septic and drain field) have failed or necessitate abandonment or relocation for any reason, or have been deemed a public health hazard by the local health authority, the **CITY** specifically reserves the right to exercise discretion in the adherence to the terms set forth herein.

495.4.1.13 Construction of the extension shall be in accordance with plans and specifications approved by the **CITY ENGINEER AND UTILITY DIRECTOR** and may be by contract awarded by the **CITY**, by the **CITY** forces, or by the applicant with the approval of the City Council, all as addressed by the agreement between the **CITY** and the applicant.

DIVISION 490

SECTION 496

SANITARY SEWER SYSTEM

ASBUILTS

SECTION 496
SANITARY SEWER SYSTEM ASBUILTS

496.1 GENERAL

496.1.1 All as-builts for projects are required to be on at least 24" x 36" paper, and shall bear the name, address, and telephone number of the firm preparing the drawing and the date the as-built data is added to the original via the revision block. 3-sets of plans and one electronic copy of the plans are required to be submitted. The electronic AutoCAD drawing files shall be referenced to Georgia State Plane Coordinates, West Zone (NAD 83, 2007 adjustment) and NAVD 88.

496.1.2 Surveyor's statement (with seal and with an original signature on each sheet) shall verify that as-built drawings reflect the true conditions in the field or Engineer's statement (with seal and an original signature on each sheet) shall state that the project will function as was originally intended on the approved construction plans.

496.1.3 Contractors' statement (with an original signature on each sheet) shall verify that all construction specifications and product qualities have been met or exceeded.

496.1.4 "AS-BUILT DRAWING" or "RECORD DRAWING", the name of the project and the date shall be clearly labeled on each sheet.

496.1.5 Street names shall be on all streets. All easements and right-of-ways shall be shown and clearly labeled.

496.1.6 If the utility system is to be private (not to be dedicated to City), then so state on each sheet.

496.1.7 The location and elevation of the benchmark referenced will be shown on the drawing. If the referenced benchmark is not within the project, then a complete description of its location will be provided to assist in future locating.

496.1.8 The locations and description of any utility lines and other installations of any kind or other description known to exist within the construction area. The location includes dimensions to permanent features. The construction area is defined as the area on site that is disturbed.

496.1.9 The locations and dimensions of any changes to buildings and structures.

496.1.10 Correct grade and alignment of roads.

496.1.11 Changes in details of design or additional information such as approved placement details, pipe sizes, material changes, etc.

496.2 ASBUILT PLANS

496.2.1 General

The following information is required on all asbuilt drawings. The **CONTRACTOR** shall note that additional information may be required by the **CITY ENGINEER AND UTILITY DIRECTOR** when deemed necessary.

496.2.2 Public Projects

496.2.2.1 All piping, wyes, valves, manholes and special cases shall be located in two directions horizontally and one direction vertically, in the same manner as water locations. All wyes should be located in two directions horizontally.

496.2.2.2 Horizontal dimensions shall be to the nearest tenth of a foot (i.e., 78.6'). Vertical dimensions shall be to the nearest hundredth of a foot (i.e., 217.65').

496.2.2.3 Identify runs of gravity mains (i.e., 300.4 feet of 8" PVC SDR 35 at 0.4%).

496.2.2.4 Elevations shall be given for the top of all manhole covers and for all inverts.

496.2.2.5 Service laterals are to be identified with location of end service or plug (station and offset measured upstream).

496.2.2.6 Manholes shall be identified by types.

496.2.3 Private Projects

496.2.3.1 All piping, wyes, valves, manholes and special cases located within City right-of-way and easements shall be located in two directions horizontally and one direction vertically, in the same manner as water locations. All wyes should be located in two directions horizontally.

496.2.3.2 Horizontal dimensions shall be to the nearest tenth of a foot (i.e., 78.6'). Vertical dimensions shall be to the nearest hundredth of a foot (i.e., 217.65').

496.2.3.3 Identify runs of gravity mains (i.e., 300.4 feet of 8" PVC SDR 35 at 0.4%).

496.2.3.4 Elevations shall be given for the top of all manhole covers and for all inverts located within City right-of-way and easements.

496.2.3.5 Service laterals are to be identified with location of end service or plug (station and offset measured upstream).

496.2.4 Force Mains

496.2.4.1 Locate all valves, fittings, etc. in two directions as above.

496.2.4.2 Locations of pipe shall be shown at all changes in direction and at a maximum of every 100’.

496.2.4.3 Show all sizes and types of valves, fittings, pipe, etc.

496.2.4.4 Special detail drawings will be required where installations were not as shown on original drawings due to field conditions or where required for clarity.

496.2.4.2 Lift Stations

496.2.4.3.1 Wet well size and location shall be shown.

496.2.4.3.2 Elevations for top, bottom, inverts, adjacent ground and type and size of lines and fittings for all lines entering or leaving the wet well.

496.2.4.3.3 All schedules which show pump, motor and electrical data shall be amended and shall be submitted with wet well drawings.

496.2.4.3.4 All improvements within the pump station boundaries shall be located horizontally and vertically to the nearest tenth of a foot (i.e., 5.6', including valve pit, pump-out, water spigot, backflow device, wet well, control panel, bends, fittings, etc.).

496.3 TELEVISION INSPECTION

496.3.1 General

496.3.1.1 The **CONTRACTOR** shall furnish all labor, materials and equipment and perform all operations for the television inspection of the completed sanitary sewer system including necessary cleaning of the sewers.

496.3.1.2 All materials, equipment and workmanship shall be first class and to the highest industry standards. Material and equipment shall be in good condition and designed specifically for the functions for which the **CONTRACTOR** utilizes them**.**

496.3.1.3 The term "manhole section" as used in this section shall mean the entire length of pipe between and connecting two (2) manholes. The term "clean" as used in this section shall mean the complete and total removal of all solid or semi-solid materials from the sewer.

496.3.1.4 Necessary cleaning and the television inspection shall not be done until after the sewer system improvements, or an appropriate portion thereof, described by the plans and Contract Documents have been completed, roadway construction is completed, and remaining work would not be expected to damage the sewer system. However, the television inspection must be completed prior to placement of the final course of asphalt.

496.3.1.5 The sequence of operations shall be:

a. Cleaning
b. Hand pulling mandrel
c. Additional cleaning if required
d. Television inspection with continuous CD or DVD and audio

496.3.1.6 **CONTRACTOR** or selected subcontractors shall meet, as a minimum, the following requirements:

a. At least two (2) projects of similar magnitude and nature satisfactorily completed within the last year.

b. At least three (3) satisfactory references from professionals attesting to the **CONTRACTOR** or subcontractors ability to do the work.

496.3.1.7 The **CONTRACTOR** shall be responsible for and pay all costs for correcting any and all defects in the sewer system made apparent by any and all inspections and tests, even if the work or parts of the work may have passed the other tests and inspections. Further, the **CONTRACTOR** shall be held completely and solely responsible for the repair of other items of work including but not being limited to roadways, manholes, lift stations, etc., and shall pay any and all costs incurred by any party or anyone whosoever resulting from defects in material, equipment or labor or his failure to properly protect the work.

496.3.1.8 The **CONTRACTOR** shall be responsible for securing an adequate means of providing water for the cleaning operation and, if a fire hydrant is used, shall pay all required meter deposits and charges. The **CONTRACTOR** shall not use un-metered water. Television inspection will not take place unless lines are properly cleaned.

496.3.1.9`Provide written report and CD or DVD upon completion to the City of Valdosta.

496.3.2 Line Cleaning

496.3.2.1 General

496.3.2.1.1 The **CONTRACTOR** shall provide all equipment, materials, labor and plans for the cleaning and material removal operation. Cleaning shall be done as deemed necessary by the **CITY ENGINEER** or **UTILITY DIRECTOR** for the proper television inspection of the sewer line.

496.3.2.1.2 Cleaning shall be by hydraulically propelled or mechanically operated cleaning equipment. Roots, grease, and other debris or intrusions shall first be removed by appropriate mechanical cleaning equipment if necessary, then hydraulic cleaning shall be accomplished to insure line sections are sufficiently clean for inspecting.

496.3.2.1.3 The **CONTRACTOR** shall determine prior to submission of his bid, the amount of material to be removed from the pipeline, the type of cleaning, and the equipment required by making a field inspection of the pipeline.

496.3.2.1.4 The equipment used for cleaning line sections shall be capable of removing dirt, rocks, roots, and other deleterious materials and obstructions from line sections.

496.3.2.2 Cleaning Equipment

496.3.2.2.1 Whenever bucket machines are used, the bucketing process shall be in one line section at a time. A bucket of proper size shall be placed into the downstream manhole and pulled toward the upstream manhole. The bucket shall be retrieved and emptied at varying intervals, depending upon the amount of material being removed. This process shall be repeated until the bucket has been pulled through the entire line section. Upon completion of the bucketing, a movable dam of size equal to the line size, shall be propelled through the line to insure that all sand, grease, and other material have been removed.

496.3.2.2.2 Power rodding machines shall be of a continuous rod type capable of operating between manholes. Machine shall have a positive rod drive and be capable of performing the task required. Cutters shall be the proper size for the pipe being cleaned. Satisfactory precautions shall be taken to protect sewer lines from damage that might be caused by the improper use of cleaning equipment.

Material removed from line sections either by bucketing or rodding shall be disposed of at a sanitary landfill or as designated by the **CITY ENGINEER.**

496.3.2.2.3 Whenever hydraulically propelled cleaning tools are used which depend on water pressure for their cleaning force, precautions shall be taken to insure that the water pressure created does not cause any damage or flooding to public or private property being served by the line section involved. Water for cleaning trucks may be obtained from fire hydrants where available, but the **CONTRACTOR** shall take all precautions to conserve water and not use it unnecessarily. No fire hydrant shall be obstructed in case of fire in the area served by the hydrant. The **CONTRACTOR** shall exercise care so as not to damage the hydrants used. Proper precautions shall be taken at the downstream manhole to allow only the cleaning water to enter the line section downstream of the one being cleaned. All sludge, dirt, sand, rocks, grease, or other solid material resulting from the cleaning operation shall be trapped at and removed from the downstream manhole of the line section being cleaned. The solids shall then be disposed of at an approved disposal site.

496.3.2.3 Transporting Material

Trucks or trailers used with the cleaning equipment to transport the material removed from the pipeline shall be of adequate size for the service intended. They shall be of a type to preclude dropping, spilling, or leaking of material removed from the pipeline onto the roadway over the route between the cleaning operation and the point of disposal.

496.3.2.4 Sewer Line Flow Control

When elimination of flow in a line section is necessary for proper inspection, as determined by the **UTILITY DIRECTOR**, the following method of flow control shall be used:

When designated by the **UTILITY DIRECTOR**, a sewer line plug shall be inserted into the line at a manhole upstream of the section to be inspected. The plug shall be so designed that all or any portion of the sewage flow can be released. During inspection operations, flows shall be blocked in order to properly inspect the pipe at the invert. After inspection is complete, flow may be restored to normal or not more than one-half of the pipe diameter in order to avoid damage downstream. The **CONTRACTOR** shall be responsible for any damage caused by flooding during the time the sewer is plugged and shall take care to avoid any such occurrence and shall hold the **CITY**, the **CITY ENGINEER,** and **UTILITY DIRECTOR** harmless.

496.3.3 Television Inspection

496.3.3.1 General

The **CONTRACTOR** shall provide all equipment, materials, labor and plans for the inspection of the entire length of pipeline following the cleaning operation. Inspection shall be accomplished by means of closed circuit television. The work shall be performed under the continuous inspection of the **UTILITY DIRECTOR** or a designated representative.

496.3.3.2 Equipment

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. The camera shall be mounted on a carriage to keep it in the center of the pipe. Lighting for the camera shall be supplied by a lamp on the camera capable of being dimmed or brightened remotely from the control panel. The lighting system shall be capable of lighting the entire periphery of the pipe, satisfactory to the **UTILITY DIRECTOR.** The camera shall be operative in 100% humidity conditions and shall have a minimum of 650 lines of resolution and tested to 400 psi. Telephones, sound power communication systems, or other suitable means of communication shall be set up between the winch at the manholes and the monitor control and operation van. Picture quality and definition shall be to the satisfaction of the **UTILITY DIRECTOR** and if unsatisfactory, the equipment shall be removed and no payment made for unsatisfactory inspection. A level gauge shall be attached to the camera so depth of water held in the lines can be measured.

496.3.3.3 Televising

The camera shall be moved through the sewer line in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's condition but in no case shall the television camera be pulled at a speed greater than thirty feet (30') per minute. Manual winches, power winches, television cable, powered rewinds, or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.

496.3.3.4 Written Record

Written location records shall be kept by the **CONTRACTOR** and shall clearly show the exact location, in relation to adjacent manholes, of each infiltration point discovered by the television camera. In addition, all wyes, tees, and other discernible features, including any defects, shall be recorded on a CD or DVD and a copy of such records shall be supplied to the **UTILITY DIRECTOR** and **CITY ENGINEER.** The **CONTRACTOR** shall also supply the **UTILITY DIRECTOR** and **CITY ENGINEER** with a typed copy of such records. The format of such records shall be as approved by the **UTILITY DIRECTOR** and **CITY ENGINEER** and shall contain all information pertinent to the inspection which may be required by the **UTILITY DIRECTOR** and **CITY ENGINEER**.

496.3.3.5 Continuous Video Tapes

496.3.3.5.1 The television inspection of each manhole section shall be continuous and shall be on not more than one continuous CD or DVD. The CD or DVD shall be made immediately after the section has been cleaned. All tapes shall be delivered to the **CITY** and become the **CITY'S** property upon delivery. All tapes shall be made in color, not black-and-white.

496.3.3.5.2 All video shall have a continuous display of footage, manhole section, and date. At the beginning of each manhole section, the **CONTRACTOR** shall identify the name of the program, the location of the project, the number of the tape, the beginning manhole number, and the ending manhole number.

496.3.3.5.3 CDs or DVDs shall be designed for use on computers.

496.3.3.5.4 Each CD or DVD shall be clearly identified on the outside by a typed label providing the following information:

Bid Number – (when applicable)
Project Name — Written Report Number(s)
Date Televised — Contractor

496.3.3.6 Measurements

Measurement for location of defects, wyes, open joints, and other points of significance shall be above-ground by means of a meter device. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to two-tenths (0.2) of a foot over the length of the section being inspected. Accuracy of the measurement meters shall be checked daily by a suitable device.

496.3.3.7 Audio

All comments made for the written record as required by the **UTILITY DIRECTOR** and **CITY ENGINEER** and those comments required by the industry's highest standards shall be made on the video. The audio shall be clearly understandable and of a quality satisfactory to the **UTILITY DIRECTOR** and **CITY ENGINEER**. If unsatisfactory to the **UTILITY DIRECTOR** and **CITY ENGINEER,** the **CONTRACTOR** shall provide satisfactory equipment and perform again the inspections which were deemed unacceptable by the **UTILITY DIRECTOR** and **CITY ENGINEER**. No payment shall be made for unsatisfactory inspection.

496.3.3.8 Acceptance

If television inspection shows that the lines have not been properly cleaned, inspection will cease and will not proceed or be accepted until the lines are clean as determined by the **CITY ENGINEER, UTILITY DIRECTOR,** or a designated representative.

Lines that show a ponding of water will have to be corrected before acceptance. Lines that show more than one-half inch (½") of ponding will have to be excavated and corrected. The intent is not to have any areas that would collect sediment. The ponding will be measured using a level gauge measured in inches. No other method will be accepted.

After all areas are corrected, the lines in question will be re-televised to ensure they have been corrected.

DIVISION 490

SECTION 497

SANITARY SEWER SYSTEM

MEASUREMENT AND PAYMENT

SECTION 497

SANITARY SEWER SYSTEM MEASUREMENT AND PAYMENT

497.1 GENERAL

497.1.1 All measurements and payments shall be based on completed work performed in strict accordance with the drawings and specifications and in accordance with the unit and lump sum prices in the Proposal.

497.1.2 Unless otherwise specified, the price for those items which involve excavation shall include compensation for disposal of surplus excavated materials and furnishing and installing any required supplemental fill; furnishing, placing and later removing such sheeting and bracing as may be necessary, and handling water or sewage flows as necessary.

497.1.3 Each unit or lump sum price stated in the proposal shall constitute full compensation for each complete item of work and shall be installed complete.

497.1.4 The **CONTRACTOR** shall be responsible for any debris and/or foreign matter which is allowed to enter the system as a result of construction and shall be solely responsible for any damage resulting therefrom.

497.1.5 Whenever any authorized change or combination of changes in the plans results in an increase or decrease in the original contract quantities, and the work added or eliminated is of the same general character as that shown on the original plans, the **CONTRACTOR** shall accept payment in full at the original contract unit prices for actual quantities of work done, and no allowance will be made for any loss of anticipated profits because of increases or decreases in quantities; provided, however, that increased or decreased work covered by a supplemental agreement shall be paid for as stipulated in such agreement.

497.1.6 The **CITY ENGINEER** and **UTILITY DIRECTOR** shall have the right to make alterations in the plans or character of the work as may be considered necessary or desirable during the progress of the work for satisfactory completion of the proposed construction, provided that no alteration shall be made which will result in a substantial change in the general plan or character of the work such as to evade the competitive bidding statute. Alterations provided for herein shall not be considered as a waiver of any conditions of the contract or the bond, nor to invalidate any of the provisions thereof.

497.1.7 These specifications, the plans, special provisions, and all supplementary documents are integral parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In addition to the work and materials specifically called for in the specifications as being included in any specific pay item, additional incidental work, not specifically mentioned, will be included in such pay item when so shown in the plans, or if indicated, or obvious and apparent, as being necessary for the proper completion of the work under such pay item and not stipulated as being

covered under other pay items. No additional compensation shall be allowed for such incidental work. In case of discrepancy, computed dimensions shall govern over scaled dimensions, plans shall govern over standard specifications, and special provisions shall govern over both standard specifications and plans unless otherwise specified by the **CITY ENGINEER** or **UTILITY DIRECTOR**.

497.1.8 The **CONTRACTOR** is warned that some abandonments of portions of the sewer system as well as connections, activations, replacements, extensions thereto and thereof may necessitate work being done after or before normal work hours, said decision resting solely with the **CITY ENGINEER** and **UTILITY DIRECTOR**. Normally such work will be required only to maintain service to existing customers or to minimize inconvenience to those customers or members of the public. However, this work shall be considered incidental to the construction and no additional compensation shall be allowed therefore.

497.1.9 Unless otherwise provided in the specifications for the particular items involved, all measurements shall be taken from "finished grades and elevations" for vertical measurements and from pipe ends horizontally for lineal measurements. The method or combination of methods or measurements shall be those which will reflect with reasonable accuracy the actual areas of the finished work as determined by the **CITY ENGINEER** and **UTILITY DIRECTOR**.

497.1.10 Unless provided by specific bid items in the Schedule of Prices Bid, compensation for any and all clearing and grubbing which may be required for the work shall be deemed to have been included in the payments for bid items to which said clearing and grubbing is incidental and no additional compensation shall be allowed therefore.

497.1.11 The **CONTRACTOR** shall not be allowed additional payment or compensation for removing and replacing, relocating or otherwise protecting or adjusting existing culverts or other existing storm water facilities which may be affected by the construction. The cost thereof shall be included in the cost of bid items to which they are incidental or appurtenant.

497.1.12 No additional payment will be made for the work specified in GDOT Standard Specifications, Random Clearing and Grubbing – except those items outlined in the Schedule of Prices Bid. The **CONTRACTOR'S** unit or lump sum price as set forth in the proposal for the size of sewer and type of sewer required; for the installation of manholes and miscellaneous structures; for the installation of pumping stations and related work; for the removal and later replacement of pavement, curb and gutter; or for other appurtenant work items; shall include the cost of the work items in this section.

497.1.13 No additional payment will be made for the work specified in GDOT Standard Specifications, Excavation and Backfill for Minor Structures – except those items outlined in the Schedule of Prices Bid. The cost thereof is to be included in the unit price set forth in the Proposal for the items to which the excavation and backfill is incidental or appurtenant.

497.1.14 No measurement or payment shall be made for steel drag shields or trench boxes; for timber sheeting driven and left in place; for timber sheeting driven and pulled; for steel sheeting driven and pulled, all depths; nor for sheeting for pumping stations, treatment plant facilities, etc. The cost therefore shall be merged with the cost of items to which they are incidental or appurtenant.

497.1.15 No separate payment will be made for the work inherent to Dewatering. The cost thereof shall be included in the price for related items as set forth in the proposal.

497.1.16 No additional payment shall be made for the work specified in GDOT Standard Specifications – Random Clearing and Grubbing. The cost thereof shall be included in the price for related items as set forth in the proposal.

497.1.17 No additional payment shall be made for the work specified in GDOT Standard Specifications–Seed and Sod, except for those items outlined in the Schedule of Prices Bid. The cost thereof shall be included in the price for related items as set forth in the proposal.

497.1.18 Except those items outlined in the Schedule of Prices Bid, the **CONTRACTOR** shall not be allowed additional payment or compensation for removing and replacing, shoring or bracing, relocating or otherwise protecting or adjusting any and all utilities shown on the plans which may be affected by the construction. Specifically, the **CONTRACTOR** shall adjust all manhole frames and covers to required grades. All methods of adjusting utilities shall be subject to the approval of the **UTILITY DIRECTOR** and **CITY ENGINEER**. The cost of items described herein shall be included in the cost of bid items to which they are incidental or appurtenant.

497.1.19 The **CONTRACTOR** shall furnish and install any and all materials necessary for manhole ring and cover adjustments, miscellaneous concrete and appurtenant items that they may be necessary for the proper execution of the work. The adjustments of manhole rings and covers shall include the "breaking down" of these items to facilitate road construction, if required. Adjustments shall also include any concrete collars required. It is the intent of this paragraph that all manhole rings and covers be installed and subsequently adjusted to finished grade. The cost of these items of work is to be included in the bid items to which they are incidental or appurtenant and no additional compensation shall be allowed therefore.

497.1.21 Except for those bid items detailed in the Schedule of Prices Bid, no additional payment shall be made for connecting lines to existing lines or for making the various connections in the system as shown on the plans.

497.1.22 It is the intent of this contract that all pavement replacement including trench width, resurfacing, and full width to be done at the same time.

497.1.23 Pipe which has not been properly laid, bedded, jointed, or backfilled shall not be included for payment in any pay estimate.

497.1.24 The term "finished grade" as used herein shall mean the final elevation of the accepted work as approved by the **CITY ENGINEER**, and in GDOT right-of-way,

shall be the elevation required and approved by the GDOT to conform to its work as proposed or later modified. It shall be the **CONTRACTOR'S** responsibility to determine the finished grade at any point as required by the **CITY ENGINEER** or GDOT.

497.2 DETAILED MEASUREMENT AND PAYMENT

497.2.1 The following list of pay items are standard items used by the **CITY** for sanitary sewer construction. This list includes pay item numbers and the detailed measurement and payment relating to those items. For those pay items which were not included in the schedule of prices bid, it shall be mutually understood that all items for payment shall be made from the master list of pay items set forth below. Items that are not specifically listed hereafter shall utilize the basic numbering system set forth.

497.2.2 Reserved

497.2.3 Standard Pay Items

497 SANITARY SEWER SYSTEM

497-01.01.01	8" PVC – 0' to 6'	LF
497-01.01.02	8" PVC – 6' to 8'	LF
497-01.01.03	8" PVC – 8' to 10'	LF
497-01.01.04	8" PVC – 10' to 12'	LF
497-01.01.05	8" PVC – 12' to 14'	LF
497-01.01.06	8" PVC – 14' to 16'	LF
497-01.01.07	8" PVC – 16' to 18'	LF
497-01.01.08	8" PVC – 18' to 20'	LF
497-01.01.09	Reserved	
497-01.02.01	10" PVC – 0' to 6'	LF
497-01.02.02	10" PVC – 6' to 8'	LF
497-01.02.03	10" PVC – 8' to 10'	LF
497-01.02.04	10" PVC – 10' to 12'	LF
497-01.02.05	10" PVC – 12' to 14'	LF
497-01.02.06	10" PVC – 14' to 16'	LF
497-01.02.07	10" PVC – 16' to 18'	LF
497-01.02.08	10" PVC – 18' to 20'	LF
497-01.02.09	Reserved	
497-01.03.01	12" PVC – 0' to 6'	LF
497-01.03.02	12" PVC – 6' to 8'	LF
497-01.03.03	12" PVC – 8' to 10'	LF
497-01.03.04	12" PVC – 10' to 12'	LF
497-01.03.05	12" PVC – 12' to 14'	LF
497-01.03.06	12" PVC – 14' to 16'	LF
497-01.03.07	12" PVC – 16' to 18'	LF
497-01.03.08	12" PVC – 18' to 20'	LF

497-01.03.09	Reserved	
497-01.04.01	15” PVC – 0’ to 6’	LF
497-01.04.02	15” PVC – 6’ to 8’	LF
497-01.04.03	15” PVC – 8’to 10’	LF
497-01.04.04	15” PVC – 10’ to 12’	LF
497-01.04.05	15” PVC – 12’ to 14’	LF
497-01.04.06	15” PVC – 14’ to 16’	LF
497-01.04.07	15” PVC – 16’ to 18’	LF
497-01.04.08	15” PVC – 18’ to 20’	LF
497-01.04.09	Reserved	
497-01.05.01	18” PVC – 0’ to 6’	LF
497-01.05.02	18” PVC – 6’ to 8’	LF
497-01.05.03	18” PVC – 8’ to 10’	LF
497-01.05.04	18” PVC – 10’ to 12’	LF
497-01.05.05	18” PVC – 12’ to 14’	LF
497-01.05.06	18” PVC – 14’ to 16’	LF
497-01.05.07	18” PVC – 16’ to 18’	LF
497-01.05.08	18” PVC – 18’ to 20’	LF
497-01.05.09	Reserved	
497-01.06.01	24” PVC – 0’ to 6’	LF
497-01.06.02	24” PVC – 6’ to 8’	LF
497-01.06.03	24” PVC – 8’ to 12’	LF
497-01.06.04	24” PVC – 12’ to 14’	LF
497-01.06.05	24” PVC – 14’ to 16’	LF
497-01.06.06	24” PVC – 16’ to 18’	LF
497-01.06.07	24” PVC – 18’ to 20’	LF
497-01.06.08	Reserved	
497-01.07.01	30” PVC – 0’ to 6’	LF
497-01.07.02	30” PVC – 6’ to 8’	LF
497-01.07.03	30” PVC – 8’ to 10’	LF
497-01.07.04	30” PVC – 10’ to 12’	LF
497-01.07.05	30” PVC – 12’ to 14’	LF
497-01.07.06	30” PVC – 14’ to 16’	LF
497-01.07.07	30” PVC – 16’ to 18’	LF
497-01.07.08	30” PVC – 18’ to 20’	LF
497-01.07.09	Reserved	
497-01.10.01	8” DIP – 0’ to 6’	LF
497-01.10.02	8” DIP – 6’ to 8’	LF
497-01.10.03	8” DIP – 8’ to 10’	LF
497-01.10.04	8” DIP – 10’ to 12’	LF
497-01.10.05	8” DIP – 12’ to 14’	LF
497-01.10.06	8” DIP – 14’ to 16’	LF
497-01.10.07	8” DIP – 16’ to 18’	LF
497-01.10.08	8” DIP – 18’ to 20’	LF
497-01.10.09	Reserved	
497-01.11.01	10” DIP – 0’ to 6’	LF
497-01.11.02	10” DIP – 6’ to 8’	LF

497-01.11.03	10” DIP – 8’ to 10’	LF
497-01.11.04	10” DIP – 10’ to 12’	LF
497-01.11.05	10” DIP – 12’ to 14’	LF
497-01.11.06	10” DIP – 14’ to 16’	LF
497-01.11.07	10” DIP – 16’ to 18’	LF
497-01.11.08	10” DIP – 18’ to 20’	LF
497-01.11.09	Reserved	
497-01.12.01	12” DIP – 0’ to 6’	LF
497-01.12.02	12” DIP – 6’ to 8’	LF
497-01.12.03	12” DIP – 8’ to 10’	LF
497-01.12.04	12” DIP – 10’ to 12’	LF
497-01.12.05	12” DIP – 12’ to 14’	LF
497-01.12.06	12” DIP – 14’ to 16’	LF
497-01.12.07	12” DIP – 16’ to 18’	LF
497-01.12.08	12” DIP – 18’ to 20’	LF
497-01.12.09	Reserved	
497-01.20.01	Abandon Sanitary Sewer Main	LS
497-01.20.02	Reserved	

Measurement of sewer mains shall be in linear feet of actual pipe installed from end to end. Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, pipe installation, and other items required to complete the installation.

497-10.01.01	Sewer Manhole w/Epoxy - 0’ to 6’	EA
497-10.01.02	Sewer Manhole w/Epoxy – 6’ to 8’	EA
497-10.01.03	Sewer Manhole w/Epoxy – 8’ to 10’	EA
497-10.01.04	Sewer Manhole w/Epoxy – 10’ to 12’	EA
497-10.01.05	Sewer Manhole w/Epoxy – 12’ to 14’	EA
497-10.01.06	Sewer Manhole w/Epoxy – 14’ to 16’	EA
497-10.01.07	Sewer Manhole w/Epoxy – 16’ to 18’	EA
497-10.01.08	Sewer Manhole w/Epoxy – 18’ to 20’	EA
497-10.01.09	Reserved	
497-10.02.01	Sewer Manhole w/HDPE Liner – 0’ to 6’	EA
497-10.02.02	Sewer Manhole w/HDPE Liner – 6’ to 8’	EA
497-10.02.03	Sewer Manhole w/HDPE Liner – 8’ to 10’	EA
497-10.02.04	Sewer Manhole w/HDPE Liner – 10’ to 12’	EA
497-10.02.05	Sewer Manhole w/HDPE Liner – 12’ to 14’	EA
497-10.02.06	Sewer Manhole w/HDPE Liner – 14’ to 16’	EA
497-10.02.07	Sewer Manhole w/HDPE Liner – 16’ to 18’	EA
497-10.02.08	Sewer Manhole w/HDPE Liner – 18’ to 20’	EA
497-10.02.09	Reserved	
497-10.03.01	Sewer Manhole over Existing 8” Pipe – 0’ to 6’	EA
497-10.03.02	Sewer Manhole over Existing 8” Pipe – 6’ to 8’	EA
497-10.03.03	Sewer Manhole over Existing 8” Pipe – 8’ to 10’	EA
497-10.03.04	Sewer Manhole over Existing 8” Pipe – 10’ to 12’	EA
497-10.03.05	Sewer Manhole over Existing 8” Pipe – 12’ to 14’	EA
497-10.03.06	Sewer Manhole over Existing 8” Pipe – 14’ to 16’	EA

497-10.03.07	Sewer Manhole over Existing 8” Pipe – 16’ to 18’	EA
497-10.03.08	Sewer Manhole over Existing 8” Pipe – 18’ to 20’	EA
497-10.03.09	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 0’ to 6’	EA
497-10.03.10	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 6’ to 8’	EA
497-10.03.11	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 8’ to 10’	EA
497-10.03.12	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 10’ to 12’	EA
497-10.03.13	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 12’ to 14’	EA
497-10.03.14	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 14’ to 16’	EA
497-10.03.15	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 16’ to 18’	EA
497-10.03.16	Sewer Manhole over Existing 8” Pipe w/HDPE Liner – 18’ to 20’	EA
497-10.03.17	Sewer Manhole over Existing 10” Pipe – 0’ to 6’	EA
497-10.03.18	Sewer Manhole over Existing 10” Pipe – 6’ to 8’	EA
497-10.03.19	Sewer Manhole over Existing 10” Pipe –8’ to 10’	EA
497-10.03.20	Sewer Manhole over Existing 10” Pipe – 10’ to 12’	EA
497-10.03.21	Sewer Manhole over Existing 10” Pipe – 12’ to 14’	EA
497-10.03.22	Sewer Manhole over Existing 10” Pipe – 14’ to 16’	EA
497-10.03.23	Sewer Manhole over Existing 10” Pipe – 16’ to 18’	EA
497-10.03.24	Sewer Manhole over Existing 10” Pipe – 18’ to 20’	EA
497-10.03.25	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 0’ to 6’	EA
497-10.03.26	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 6’ to 8’	EA
497-10.03.27	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 8’ to 10’	EA
497-10.03.28	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 10’ to 12’	EA
497-10.03.29	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 12’ to 14’	EA
497-10.03.30	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 14’ to 16’	EA
497-10.03.31	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 16’ to 18’	EA
497-10.03.32	Sewer Manhole over Existing 10” Pipe w/HDPE Liner – 18’ to 20’	EA
497-10.04.01	Conflict Manhole – 0’ to 6’	EA
497-10.04.02	Conflict Manhole – 6’ to 8’	EA
497-10.04.03	Conflict Manhole – 8’ to 10’	EA
497-10.04.04	Conflict Manhole – 10’ to 12’	EA
497-10.04.05	Conflict Manhole – 12’ to 14’	EA
497-10.04.06	Conflict Manhole – 14’ to 16’	EA
497-10.04.07	Conflict Manhole – 16’ to 18’	EA
497-10.04.08	Conflict Manhole – 18’ to 20’	EA
497-10.04.09	Reserved	
497-10.05.01	Remove and Replace Sewer Manhole – 0’ to 6’	EA
497-10.05.02	Remove and Replace Sewer Manhole – 6’ to 8’	EA
497-10.05.03	Remove and Replace Sewer Manhole – 8’ to 10’	EA
497-10.05.04	Remove and Replace Sewer Manhole – 10’ to 12’	EA
497-10.05.05	Remove and Replace Sewer Manhole – 12’ to 14’	EA
497-10.05.06	Remove and Replace Sewer Manhole – 14’ to 16’	EA
497-10.05.07	Remove and Replace Sewer Manhole – 16’ to 18’	EA
497-10.05.08	Remove and Replace Sewer Manhole – 18’ to 20’	EA
497-10.05.06	Reserved	
497-10.06.01	Remove and Replace 22” Ring and Cover on Existing Manhole	EA
497-10.06.02	Remove and Replace 32” Ring and Cover on Existing Manhole	EA
497-10.06.03	Remove Existing 22” Ring and Cover and Replace w/24” Ring & Cover	EA
497-10.06.04	Remove Existing 32” Ring and Cover and Replace w/36” Ring & Cover	EA

497-10.10.01	Raise Existing Manhole to Grade	EA
497-10.10.02	Reserved	
497-10.11.01	Remove and Replace Inverts in Existing Manhole	LS
497-10.11.02	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, gravel, structure installation, and other items required to complete the installation.

497-10.20.01	8” Sewer Manhole Drop Connection – 0’ to 6’	EA
497-10.20.02	8” Sewer Manhole Drop Connection – 6’ to 8’	EA
497-10.20.03	8” Sewer Manhole Drop Connection – 8’ to 10’	EA
497-10.20.04	8” Sewer Manhole Drop Connection – 10’ to 12’	EA
497-10.20.05	8” Sewer Manhole Drop Connection – 12’ to 14’	EA
497-10.20.06	8” Sewer Manhole Drop Connection – 14’ to 16’	EA
497-10.20.07	8” Sewer Manhole Drop Connection – 16’ to 18’	EA
497-10.20.08	8” Sewer Manhole Drop Connection – 18’ to 20’	EA
497-10.20.09	Reserved	
497-10.20.10	10” Sewer Manhole Drop Connection – 0’ to 6’	EA
497-10.20.11	10” Sewer Manhole Drop Connection – 6’ to 8’	EA
497-10.20.12	10” Sewer Manhole Drop Connection – 8’ to 10’	EA
497-10.20.13	10” Sewer Manhole Drop Connection – 10’ to 12’	EA
497-10.20.14	10” Sewer Manhole Drop Connection – 12’ to 14’	EA
497-10.20.15	10” Sewer Manhole Drop Connection – 14’ to 16’	EA
497-10.20.16	10” Sewer Manhole Drop Connection – 16’ to 18’	EA
497-10.20.17	10” Sewer Manhole Drop Connection – 18’ to 20’	EA
497-10.20.18	Reserved	
497-10.20.20	12” Sewer Manhole Drop Connection – 0’ to 6’	EA
497-10.20.21	12” Sewer Manhole Drop Connection – 6’ to 8’	EA
497-10.20.22	12” Sewer Manhole Drop Connection – 8’ to 10’	EA
497-10.20.23	12” Sewer Manhole Drop Connection – 10’ to 12’	EA
497-10.20.24	12” Sewer Manhole Drop Connection – 12’ to 14’	EA
497-10.20.25	12” Sewer Manhole Drop Connection – 14’ to 16’	EA
497-10.20.26	12” Sewer Manhole Drop Connection – 16’ to 18’	EA
497-10.20.27	12” Sewer Manhole Drop Connection – 18’ to 20’	EA
497-10.20.23	Reserved	
497-10.20.30	15” Sewer Manhole Drop Connection – 0’ to 6’	EA
497-10.20.31	15” Sewer Manhole Drop Connection – 6’ to 8’	EA
497-10.20.32	15” Sewer Manhole Drop Connection – 8’ to 10’	EA
497-10.20.33	15” Sewer Manhole Drop Connection – 10’ to 12’	EA
497-10.20.34	15” Sewer Manhole Drop Connection – 12’ to 14’	EA
497-10.20.35	15” Sewer Manhole Drop Connection – 14’ to 16’	EA
497-10.20.36	15” Sewer Manhole Drop Connection – 16’ to 18’	EA
497-10.20.37	15” Sewer Manhole Drop Connection – 18’ to 20’	EA
497-10.20.33	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall

include all costs for excavation, backfilling, dewatering, fitting installation, and other items required to complete the installation.

497-10.30.01	8” Sewer Manhole Stubout	EA
497-10.30.02	10” Sewer Manhole Stubout	EA
497-10.30.03	12” Sewer Manhole Stubout	EA
497-10.30.04	15” Sewer Manhole Stubout	EA
497-10.30.05	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, pipes, caps, and other items required to complete the installation.

497-10.40.01	Resurface Existing Manhole Interior – 0’ to 6’	LS
497-10.40.02	Resurface Existing Manhole Interior – 6’ to 8’	LS
497-10.40.03	Resurface Existing Manhole Interior – 8’ to 10’	LS
497-10.40.04	Resurface Existing Manhole Interior – 10’ to 12’	LS
497-10.40.05	Resurface Existing Manhole Interior – 12’ to 14’	LS
497-10.40.06	Resurface Existing Manhole Interior – 14’ to 16’	LS
497-10.40.07	Resurface Existing Manhole Interior – 16’ to 18’	LS
497-10.40.08	Resurface Existing Manhole Interior – 18’ to 20’	LS
497-10.40.09	Reserved	
497-10.40.10	Resurface Existing Manhole Interior, 4’ Diameter	FT
497-10.40.11	Resurface Existing Manhole Interior, 5’ Diameter	FT
497-10.40.12	Resurface Existing Manhole Interior, 6’ Diameter	FT
497-10.40.13	Resurface Existing Wet Well Interior, 8’ Diameter	FT
497-10.40.14	Resurface Existing Wet Well Interior, 10’ Diameter	FT
497-10.40.15	Resurface Existing Wet Well Interior, 12’ Diameter	FT

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for cleaning, removal of debris, removal of old coatings, application of new coatings, and other items required to complete the resurfacing of existing manholes and wet wells.

497-10.41.01	Reline Existing 6” Pipe Interior	LF
497-10.41.02	Reline Existing 8” Pipe Interior	LF
497-10.41.03	Reline Existing 10” Pipe Interior	LF
497-10.41.04	Reline Existing 12” Pipe Interior	LF
497-10.41.05	Reline Existing 14” Pipe Interior	LF
497-10.41.06	Reline Existing 16” Pipe Interior	LF
497-10.41.07	Reline Existing 18” Pipe Interior	LF
497-10.41.08	Reline Existing 20” Pipe Interior	LF
497-10.41.09	Reline Existing 24” Pipe Interior	LF
497-10.41.10	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment

shall include all costs for cleaning, excavation, removal of debris, removal of old coatings, application of new lining, and other items required to complete the re-lining of existing piping.

497-10.50.01	Abandon Sanitary Sewer Manhole	EA
497-10.50.02	Reserved	
497-10.60.01	Connect New 8” Main to Existing Manhole	EA
497-10.60.02	Connect New 10” Main to Existing Manhole	EA
497-10.60.03	Connect New 12” Main to Existing Manhole	EA
497-10.60.04	Connect New 15” Main to Existing Manhole	EA
497-10.60.05	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, cutting of pipe, connections, accessories, and other items required to complete the installation.

497-20.01.01	6” PVC Sewer Service	LF
497-20.01.02	Remove and Replace Sewer Service	EA
497-20.01.03	Extend Plumbing to New Service	LS
497-20.01.04	Reconnect Service to Lined Pipe	EA
497-20.01.05	Reserved	
497-20.02.01	PVC 8” x 6” Wye and Bend	EA
497-20.02.02	PVC 10” x 6” Wye and Bend	EA
497-20.02.03	PVC 12” x 6” Wye and Bend	EA
497-20.02.04	PVC 15” x 6” Wye and Bend	EA
497-20.02.05	Reserved	
497-20.03.01	6” 2-way Cleanout	EA

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, pipe, fittings installation, and other items required to complete the service installation.

497-30.01.00	Television Inspection 6” Main	LF
497-30.01.01	Television Inspection 8” Main	LF
497-30.01.02	Television Inspection 10” Main	LF
497-30.01.03	Television Inspection 12” Main	LF
497-30.01.04	Television Inspection 15” Main	LF
497-30.01.05	Television Inspection 16” Main	LF
497-30.01.06	Television Inspection 18” Main	LF
497-30.01.07	Television Inspection 21” Main	LF
497-30.01.08	Television Inspection 24” Main	LF
497-30.01.09	Television Inspection 30” Main	LF
497-30.01.10	Television Inspection 36” Main	LF
497-30.01.11	Television Inspection 42” Main	LF
497-30.01.12	Television Inspection 48” Main	LF
497-30.01.13	Television Inspection 54” Main	LF
497-30.01.14	Reserved	

497-30.02.01	Low Pressure Air Test	LS
497-30.02.02	Hydrostatic Testing of Force Main	LS
497-30.02.03	Manhole Leak Testing	EA
497-30.02.04	Leak Survey on Sewer Force Mains	MI
497-30.02.05	Smoke Testing	LF
497-30.02.06	Dye Testing	LF

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, test equipment, and other items required to complete the testing.

497-30.03.01	Sewer Main Heavy Cleaning – 6” Main	LF
497-30.03.02	Sewer Main Heavy Cleaning – 8” Main	LF
497-30.03.03	Sewer Main Heavy Cleaning – 10” Main	LF
497-30.03.04	Sewer Main Heavy Cleaning – 12” Main	LF
497-30.03.05	Sewer Main Heavy Cleaning – 14” Main	LF
497-30.03.06	Sewer Main Heavy Cleaning – 15” Main	LF
497-30.03.07	Sewer Main Heavy Cleaning – 16” Main	LF
497-30.03.08	Sewer Main Heavy Cleaning – 18” Main	LF
497-30.03.09	Sewer Main Heavy Cleaning – 20” Main	LF
497-30.03.10	Sewer Main Heavy Cleaning – 24” Main	LF
497-30.03.11	Sewer Main Heavy Cleaning – 30” Main	LF
497-30.03.12	Sewer Main Heavy Cleaning – 36” Main	LF
497-30.03.13	Sewer Main Heavy Cleaning – 42” Main	LF
497-30.03.14	Sewer Main Heavy Cleaning – 48” Main	LF
497-30.03.15	Sewer Main Heavy Cleaning – 54” Main	LF
497-30.03.16	Reserved	
497-30.04.01	Sewer Main Point Repairs – 6” Main (0’ – 6’)	LF
497-30.04.02	Sewer Main Point Repairs – 6” Main (6’ – 8’)	LF
497-30.04.03	Sewer Main Point Repairs – 6” Main (8’ – 10’)	LF
497-30.04.04	Sewer Main Point Repairs – 6” Main (10’ – 12’)	LF
497-30.04.05	Reserved	
497-30.04.06	Sewer Main Point Repairs – 8” Main (0’ – 6’)	LF
497-30.04.07	Sewer Main Point Repairs – 8” Main (6’ – 8’)	LF
497-30.04.08	Sewer Main Point Repairs – 8” Main (8’ – 10’)	LF
497-30.04.09	Sewer Main Point Repairs – 8” Main (10’ – 12’)	LF
497-30.04.10	Sewer Main Point Repairs – 8” Main (12’ – 14’)	LF
497-30.04.11	Sewer Main Point Repairs – 8” Main (14’ – 16’)	LF
497-30.04.12	Sewer Main Point Repairs – 8” Main (16’ – 18’)	LF
497-30.04.13	Reserved	
497-30.04.14	Sewer Main Point Repairs – 10” Main (0’ – 6’)	LF
497-30.04.15	Sewer Main Point Repairs – 10” Main (6’ – 8’)	LF
497-30.04.16	Sewer Main Point Repairs – 10” Main (8’ – 10’)	LF
497-30.04.17	Sewer Main Point Repairs – 10” Main (10’ – 12’)	LF
497-30.04.18	Sewer Main Point Repairs – 10” Main (12’ – 14’)	LF
497-30.04.19	Sewer Main Point Repairs – 10” Main (14’ – 16’)	LF

497-30.04.20	Sewer Main Point Repairs – 10” Main (16’ – 18’)	LF
497-30.04.21	Sewer Main Point Repairs – 10” Main (18’ – 20’)	LF
497-30.04.22	Reserved	
497-30.04.23	Sewer Main Point Repairs – 12” Main (0’ – 6’)	LF
497-30.04.24	Sewer Main Point Repairs – 12” Main (6’ – 8’)	LF
497-30.04.25	Sewer Main Point Repairs – 12” Main (8’ – 10’)	LF
497-30.04.26	Sewer Main Point Repairs – 12” Main (10’ – 12’)	LF
497-30.04.27	Sewer Main Point Repairs – 12” Main (12’ – 14’)	LF
497-30.04.28	Sewer Main Point Repairs – 12” Main (14’ – 16’)	LF
497-30.04.29	Sewer Main Point Repairs – 12” Main (16’ – 18’)	LF
497-30.04.30	Sewer Main Point Repairs – 12” Main (18’ – 20’)	LF
497-30.04.31	Reserved	
497-30.04.32	Sewer Main Point Repairs – 15” Main (0’ – 6’)	LF
497-30.04.33	Reserved	
497-30.04.34	Sewer Main Point Repairs – 16” Main (0’ – 6’)	LF
497-30.04.35	Reserved	
497-30.04.36	Sewer Main Point Repairs – 18” Main (0’ – 6’)	LF
497-30.04.37	Reserved	
497-30.04.38	Sewer Main Point Repairs – 20” Main (0’ – 6’)	LF
497-30.04.39	Reserved	
497-30.04.40	Sewer Main Point Repairs – 24” Main (0’ – 6’)	LF
497-30.04.41	Reserved	
497-30.05.01	Bypass Pumping	EA

Payment for these bid items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Sewer Main heavy cleaning shall include all costs for pigging line, flushing line, and vacuuming line clean. Point repairs shall include all costs for excavation, backfilling, dewatering, couplings, pipe and repair sleeves needed to replace the pipe damaged for a complete repair.

497-40.01.01	Bore and Jack 18” Steel Casing w/8” PVC	LF
497-40.01.02	Reserved	
497-40.02.01	Bore and Jack 24” Steel Casing w/8” PVC	LF
497-40.02.02	Bore and Jack 24” Steel Casing w/10” PVC	LF
497-40.02.03	Bore and Jack 24” Steel Casing w/12” PVC	LF
497-40.02.04	Reserved	
497-40.03.01	Bore and Jack 30” Steel Casing w/8” PVC	LF
497-40.03.02	Bore and Jack 30” Steel Casing w/10” PVC	LF
497-40.03.03	Bore and Jack 30” Steel Casing w/12” PVC	LF
497-40.03.04	Bore and Jack 30” Steel Casing w/15” PVC	LF
497-40.03.05	Reserved	
497-40.04.01	Bore and Jack 36” Steel Casing w/8” PVC	LF
497-40.04.02	Bore and Jack 36” Steel Casing w/10” PVC	LF
497-40.04.03	Bore and Jack 36” Steel Casing w/12” PVC	LF
497-40.04.04	Bore and Jack 36” Steel Casing w/15” PVC	LF
497-40.04.05	Bore and Jack 36” Steel Casing w/18” PVC	LF
497-40.04.06	Reserved	
497-40.05.01	Bore and Jack 42” Steel Casing w/12” PVC	LF
497-40.05.02	Bore and Jack 42” Steel Casing w/15” PVC	LF

497-40.05.03	Bore and Jack 42” Steel Casing w/18” PVC	LF
497-40.05.04	Reserved	
497-40.10.01	8” Steel Casing	LF
497-40.10.02	12” Steel Casing	LF
497-40.10.03	18” Steel Casing	LF
497-40.10.04	24” Steel Casing	LF

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, casing installation, pipe installation, and other items required to complete the bore and jack installation.

497-50.01.01	Abandon Sanitary Sewer Main	LS
497-50.01.02	Abandon Sewer Manhole	LS
497-50.01.03	Abandon and Remove Existing Lift Station	LS
497-50.01.04	Convert Existing Wet Well to Manhole	LS
497-50.01.05	Temporary By-pass Pumping	LS
497-50.01.06	Abandon Sanitary Sewer Force Main	LS

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, cutting of pipe, removal of pipe, caps, plugs, and other items required to complete the specified abandonment.

497-60.01.01	Above Ground Lift Station Installation	LS
497-60.01.02	Reserved	
497-60.02.01	6’ Diameter Wet Well Installation – 0’ to 6’	LS
497-60.02.02	6’ Diameter Wet Well Installation – 6’ to 8’	LS
497-60.02.03	6’ Diameter Wet Well Installation – 8’ to 10’	LS
497-60.02.04	6’ Diameter Wet Well Installation – 10’ to 12’	LS
497-60.02.05	6’ Diameter Wet Well Installation – 12’ to 14’	LS
497-60.02.06	6’ Diameter Wet Well Installation – 14’ to 16’	LS
497-60.02.07	6’ Diameter Wet Well Installation – 16’ to 18’	LS
497-60.02.08	6’ Diameter Wet Well Installation – 18’ to 20’	LS
497-60.02.09	Reserved	
497-60.03.01	Electrical Work	LS
497-60.03.02	Electrical Panels	LS
497-60.03.03	SCADA System	LS
497-60.03.04	SCADA System Survey	LS
497-60.03.05	Pit Evacuator Assembly	LS
497-60.04.01	Lift Station Start-up Testing	LS
497-60.04.02	Reserved	
497-70.01.01	Submersible Lift Station Installation	LS
497-70.01.02	Reserved	
497-70.02.01	8’ Diameter Wet Well Installation – 0’ to 6’	LS
497-70.02.02	8’ Diameter Wet Well Installation – 6’ to 8’	LS
497-70.02.03	8’ Diameter Wet Well Installation – 8’ to 10’	LS
497-70.02.04	8’ Diameter Wet Well Installation – 10’ to 12’	LS
497-70.02.05	8’ Diameter Wet Well Installation – 12’ to 14’	LS

497-70.02.06	8’ Diameter Wet Well Installation – 14’ to 16’	LS
497-70.02.07	8’ Diameter Wet Well Installation – 16’ to 18’	LS
497-70.02.08	8’ Diameter Wet Well Installation – 18’ to 20’	LS
497-70.02.09	Reserved	
497-70.02.10	Wet Well Top with Hatches Installation	LS
497-70.02.11	Reserved	
497-70.03.01	Electrical Work	LS
497-70.03.02	Electrical Panels	LS
497-70.03.03	SCADA System	LS
497-70.03.04	SCADA System Survey	LS
497-70.03.05	Pit Evacuator Assembly	LS
497-70.04.01	Submersible Lift Station Start-up Testing	LS
497-70.04.02	Reserved	
497-71.01.01	Submersible Lift Station Installation	LS
497-71.01.02	Reserved	
497-71.02.01	10’ Diameter Wet Well Installation – 0’ to 6’	LS
497-71.02.02	10’ Diameter Wet Well Installation – 6’ to 8’	LS
497-71.02.03	10’ Diameter Wet Well Installation – 8’ to 10’	LS
497-71.02.04	10’ Diameter Wet Well Installation – 10’ to 12’	LS
497-71.02.05	10’ Diameter Wet Well Installation – 12’ to 14’	LS
497-71.02.06	10’ Diameter Wet Well Installation – 14’ to 16’	LS
497-71.02.07	10’ Diameter Wet Well Installation – 16’ to 18’	LS
497-71.02.08	10’ Diameter Wet Well Installation – 18’ to 20’	LS
497-71.02.09	Reserved	
497-71.03.01	Electrical Work	LS
497-71.03.02	Electrical Panels	LS
497-71.03.03	SCADA System	LS
497-71.03.04	SCADA System Survey	LS
497-71.03.05	Pit Evacuator Assembly	LS
497-71.04.01	Submersible Lift Station Start-up Testing	LS
497-71.04.02	Reserved	
497-72.01.01	Submersible Lift Station Installation	LS
497-72.01.02	Reserved	
497-72.02.01	12’ Diameter Wet Well Installation – 0’ to 6’	LS
497-72.02.02	12’ Diameter Wet Well Installation – 6’ to 8’	LS
497-72.02.03	12’ Diameter Wet Well Installation – 8’ to 10’	LS
497-72.02.04	12’ Diameter Wet Well Installation – 10’ to 12’	LS
497-72.02.05	12’ Diameter Wet Well Installation – 12’ to 14’	LS
497-72.02.06	12’ Diameter Wet Well Installation – 14’ to 16’	LS
497-72.02.07	12’ Diameter Wet Well Installation – 16’ to 18’	LS
497-72.02.08	12’ Diameter Wet Well Installation – 18’ to 20’	LS
497-72.02.09	Reserved	
497-72.03.01	Electrical Work	LS
497-72.03.02	Electrical Panels	LS
497-72.03.03	SCADA System	LS
497-72.03.04	SCADA System Survey	LS
497-72.03.05	Pit Evacuator Assembly	LS
497-72.04.01	Submersible Lift Station Start-up Testing	LS

497-72.04.02	Reserved	
497-73.01.01	Submersible Lift Station Installation	LS
497-73.01.02	Reserved	
497-73.02.01	Concrete Wet Well Installation	LS
497-73.02.02	Shoring	LS
497-73.02.03	Dewatering	LS
497-73.03.01	Masonry Block Building	LS
497-73.03.02	Roof System	LS
497-73.03.03	Doors	LS
497-73.03.04	Reserved	
497-73.04.01	Generator	LS
497-73.04.02	Generator Automatic Transfer Switch	LS
497-73.04.03	Reserved	
497-73.05.01	Electrical Work	LS
497-73.05.02	Electrical Panels	LS
497-73.05.03	SCADA System	LS
497-73.05.04	Reserved	
497-73.05.05	Pit Evacuator Assembly	LF
497-73.06.01	Lift Station Start-up Testing	LS
497-73.06.02	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, equipment installation, building installations, and other items required to complete the building and lift station installations.

497-73.07.01	Reserved	LS
497-73.07.02	Reserved	LS
497-73.07.03	Reserved	LS
497-73.07.04	8” Schedule 80 PVC Drain Piping	LS
497-73.07.05	Reserved	EA
497-73.07.06	Reserved	
497-73.07.07	Reserved	EA
497-73.07.08	1” PVC Ball Valve	EA
497-73.07.09	3” PVC Ball Valve	EA
497-73.07.10	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, equipment installation, and other items required to complete the installation of the odor control system.

497-80.01.01	2” PVC Force Main	LF
497-80.01.02	4” PVC Force Main	LF
497-80.01.03	6” PVC Force Main	LF
497-80.01.04	8” PVC Force Main	LF
497-80.01.05	Reserved	
497-80.01.06	12” PVC Force Main	LF
497-80.01.07	Reserved	

497-80.02.01	PVC Flanged Piping and Fittings	LS
497-80.02.02	Reserved	
497-80.03.01	4” DIP Force Main	LF
497-80.03.02	6” DIP Force Main	LF
497-80.03.03	8” DIP Force Main	LF
497-80.03.04	Reserved	
497-80.03.05	12” DIP Force Main	LF
497-80.03.06	16” DIP Force Main	LF
497-80.03.07	18” DIP Force Main	LF
497-80.03.08	Reserved	
497-80.03.09	24” DIP Force Main	LF
497-80.03.10	Reserved	
497-80.04.01	DIP Flanged Piping and Fittings	LS
497-80.04.02	Reserved	
497-80.04.03	4” DIP Flanged Piping	LS
497-80.04.04	6” DIP Flanged Piping	LS
497-80.04.05	8” DIP Flanged Piping	LS
497-80.04.06	10” DIP Flanged Piping	LS
497-80.04.07	12” DIP Flanged Piping	LS
497-80.04.08	16” DIP Flanged Piping	LS
497-80.04.09	18” DIP Flanged Piping	LS
497-80.04.10	Reserved	
497-80.04.11	24” DIP Flanged Piping	LS
497-80.04.12	Reserved	
497-80.05.01	Abandon Sewer Force Main	LS
497-80.05.02	Reserved	

Measurement of sewer mains shall be in linear feet of actual pipe installed from end to end.

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, pipe installation, and other items required to complete the installation.

497-80.06.02	Compact DIP Fittings, 6”	TON
497-80.06.03	Compact DIP Fittings, 8”	TON
497-80.06.04	Compact DIP Fittings, 10”	TON
497-80.06.05	Compact DIP Fittings, 12”	TON
497-80.06.06	Reserved	
497-80.07.01	6” DIP MJ 22½° Bend	EA
497-80.07.02	6” DIP MJ 45° Bend	EA
497-80.07.03	6” DIP MJ 90° Bend	EA
497-80.07.04	6” DIP MJ Tee	EA
497-80.07.05	6” DIP MJ Plug	EA
497-80.07.06	Reserved	
497-80.08.01	8” DIP MJ 22½° Bend	EA
497-80.08.02	8” DIP MJ 45° Bend	EA
497-80.08.03	8” DIP MJ 90° Bend	EA
497-80.08.04	8” DIP MJ Tee	EA

497-80.08.05	8” DIP MJ Plug	EA
497-80.08.06	Reserved	
497-80.09.01	10” DIP MJ 22½° Bend	EA
497-80.09.02	10” DIP MJ 45° Bend	EA
497-80.09.03	10” DIP MJ 90° Bend	EA
497-80.09.04	10” DIP MJ Tee	EA
497-80.09.05	10” DIP MJ Plug	EA
497-80.09.06	Reserved	
497-80.10.01	12” DIP MJ 22½°Bend	EA
497-80.10.02	12” DIP MJ 45° Bend	EA
497-80.10.03	12” DIP MJ 90° Bend	EA
497-80.10.04	12” DIP MJ Tee	EA
497-80.10.05	12” DIP MJ Plug	EA
497-80.10.06	Reserved	
497-80.20.01	4” DIP Flanged 22½° Bend	EA
497-80.20.02	4” DIP Flanged 45° Bend	EA
497-80.20.03	4” DIP Flanged 90° Bend	EA
497-80.20.04	4” x 6” DIP Flanged Reducer	EA
497-80.20.05	4” x 6” DIP Flanged Wye	EA
497-80.21.01	6” x 6” DIP Flanged Wye	EA
497-80.21.02	6” DIP Flanged 22½°Bend	EA
497-80.21.03	6” DIP Flanged 45° Bend	EA
497-80.21.04	6” DIP Flanged 90° Bend	EA
497-80.21.05	6” x 8” DIP Flanged Reducer	EA
497-80.21.06	6” x 8” DIP Flanged Wye	EA
497-80.21.07	6” Camlock with Cap	EA
497-80.22.01	8” DIP Flanged 22½°Bend	EA
497-80.22.02	8” DIP Flanged 45° Bend	EA
497-80.22.03	8” DIP Flanged 90° Bend	EA
497-80.22.04	8” x 8” DIP Flanged Wye	EA
497-80.25.01	Coated Steel Pipe Supports	EA
497-80.25.02	Reserved	
497-80.30.01	Standard DIP Fittings, 18”	EA
497-80.30.02	Reserved	
497-80.30.03	Standard DIP Fittings, 24”	EA
497-80.30.04	Reserved	
497-80.31.01	18” DIP MJ 22½° Bend	EA
497-80.31.02	18” DIP MJ 45° Bend	EA
497-80.31.03	18” DIP MJ 90° Bend	EA
497-80.31.04	18” DIP MJ Tee	EA
497-80.31.05	18” DIP MJ Plug	EA
497-80.31.06	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, fitting and accessories installation, and other items required to complete the installation.

497-81.01.01	4” Plug Valve and Valve Box	EA
497-80.01.02	6” Plug Valve and Valve Box	EA
497-81.01.05	12” Plug Valve and Valve Box	EA
497-81.01.07	16” Plug Valve and Valve Box	EA
497-81.01.08	18” Plug Valve and Valve Box	EA
497-81.01.09	20” Plug Valve and Valve Box	EA
497-81.01.10	24” Plug Valve and Valve Box	EA
497-81.01.11	30” Plug Valve and Valve Box	EA
497-81.01.12	Reserved	
497-81.02.01	4” Flanged Plug Valve	EA
497-81.02.02	6” Flanged Plug Valve	EA
497-81.02.03	8” Flanged Plug Valve	EA
497-81.02.04	Reserved	
497-81.02.05	12” Flanged Plug Valve	EA
497-81.02.06	Reserved	
497-81.02.07	18” Flanged Plug Valve	EA
497-81.02.08	Reserved	
497-81.03.01	4” Flanged Check Valve	EA
497-81.03.02	6” Flanged Check Valve	EA
497-81.03.03	8” Flanged Check Valve	EA
497-81.03.04	Reserved	
497-81.03.05	12” Flanged Check Valve	EA
497-81.03.06	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, valve and accessories installation, and other items required to complete the installation.

497-81.04.01	4” Flanged Magmeter	EA
497-81.04.02	6” Flanged Magmeter	EA
497-81.04.03	8” Flanged Magmeter	EA
497-81.04.04	Reserved	
497-81.04.05	12” Flanged Magmeter	EA
497-81.04.06	Reserved	
497-81.04.07	18” Flanged Magmeter	EA
497-81.04.08	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, flowmeter installation, and other items required to complete the installation.

497-81.10.01	Air Release Valve Assembly – Type A	EA
497-81.10.02	Air Release Valve Assembly – Type B	EA
497-81.10.03	Air Release Valve Assembly – Type C	EA
497-81.10.04	Air Release Valve Installation	EA
497-81.10.05	Air Release Valve Removal and Replacement	EA

497-81.10.06 Reserved

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, valve installation, and other items required to complete the installation.

497-85.01.01	Reserved	
497-85.01.02	Connect 4” Force Main to Existing Manhole	EA
497-85.01.03	Connect 6” Force Main to Existing Manhole	EA
497-85.01.04	Connect 8” Force Main to Existing Manhole	EA
497-85.01.05	Reserved	
497-85.01.06	Connect 12” Force Main to Existing Manhole	EA
497-85.01.07	Reserved	
497-85.01.08	Connect 18” Force Main to Existing Manhole	EA
497-85.01.09	Reserved	
497-85.02.01	Connect 4” Force Main to Existing 4” Force Main	EA
497-85.02.02	Connect 4” Force Main to Existing 6” Force Main	EA
497-85.02.03	Connect 4” Force Main to Existing 8” Force Main	EA
497-85.03.01	Connect 6” Force Main to Existing 6” Force Main	EA
497-85.03.02	Connect 6” Force Main to Existing 8” Force Main	EA
497-85.04.01	Connect 8” Force Main to Existing 8” Force Main	EA
497-85.05.01	Connect 10” Force Main to Existing 10” Force Main	EA
497-85.06.01	Connect 12” Force Main to Existing 12” Force Main	EA
497-85.07.01	Connect 16” Force Main to Existing 16” Force Main	EA
497-85.08.01	Connect 18” Force Main to Existing 18” Force Main	EA
497-85.09.01	Connect 24” Force Main to Existing 24” Force Main	EA
497-85.10.01	Connect Existing Force Main to New Manhole	EA
497-85.10.02	Connect Existing Force Main to New Wet Well	EA
497-85.10.03	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, dewatering, connection, and other items required to complete the installation.

497-90.01.01	2” Tap on Existing 6” Force Main w/Valve	EA
497-90.01.02	2” Tap on Existing 8” Force Main w/Valve	EA
497-90.01.03	2” Tap on Existing 10” Force Main w/Valve	EA
497-90.01.04	2” Tap on Existing 12” Force Main w/Valve	EA
497-90.02.03	4” Tap on Existing 10” Force Main w/Valve	EA
497-90.02.04	4” Tap on Existing 12” Force Main w/Valve	EA

497-90.02.05	Reserved	
497-90.03.01	6” Tap on Existing 8” Force Main w/Valve	EA
497-90.03.02	6” Tap on Existing 10” Force Main w/Valve	EA
497-90.03.03	6” Tap on Existing 12” Force Main w/Valve	EA
497-90.03.04	Reserved	
497-90.04.01	8” Tap on Existing 8” Force Main w/Valve	EA
497-90.04.02	8” Tap on Existing 10” Force Main w/Valve	EA
497-90.04.03	8” Tap on Existing 12” Force Main w/Valve	EA
497-90.04.04	8” Tap on Existing 14” Force Main w/Valve	EA
497-90.04.05	Reserved	

Payment for these pay items shall be made at the unit price set forth in the bid schedule and shall constitute full compensation for work specified in the contract documents. Payment shall include all costs for excavation, backfilling, tapping, valve installation, and other items required to complete the installation.

DIVISION 490

SECTION 498

SANITARY SEWER SYSTEM

STANDARD DETAILS

SECTION 498
SANITARY SEWER SYSTEM STANDARD DETAILS

TABLE OF CONTENTS

C. Discharge to Existing Manhole
D. Support Bracket

498-4 SANITARY SEWER LIFT STATIONS

498-4.1 Sanitary Sewer Lift Station

A. Sanitary Sewer Above Ground Installation, 7 sheets
B. Sanitary Sewer Submersible Installation, 6 sheets

498-4.2 Sanitary Sewer Lift Station and Odor Control System

A. Sanitary Sewer Odor Control System Installation, 4 sheets

498-5 RESERVED

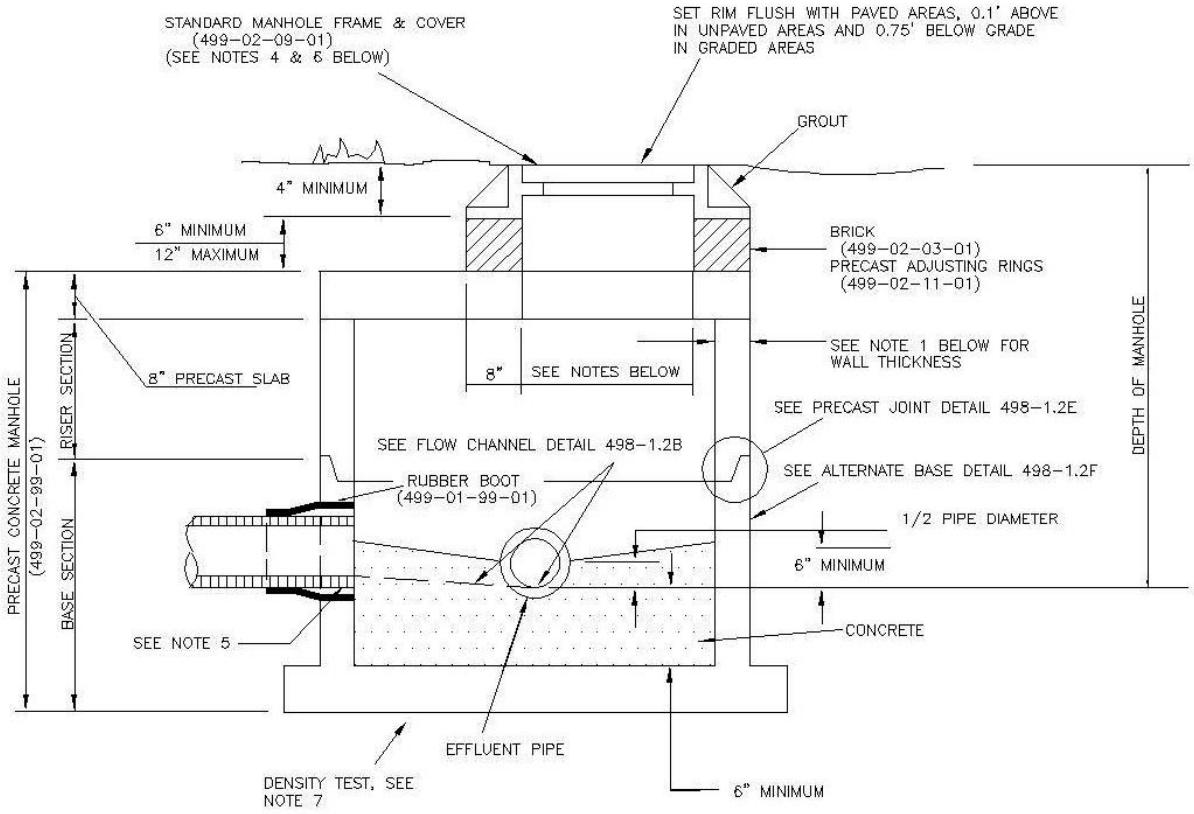
498-6 RESERVED

498-7 RESERVED

498-8 RESERVED

498-9 ASBUILT DRAWING

498-9.1 A. Typical Sanitary Sewer Asbuilt Drawing

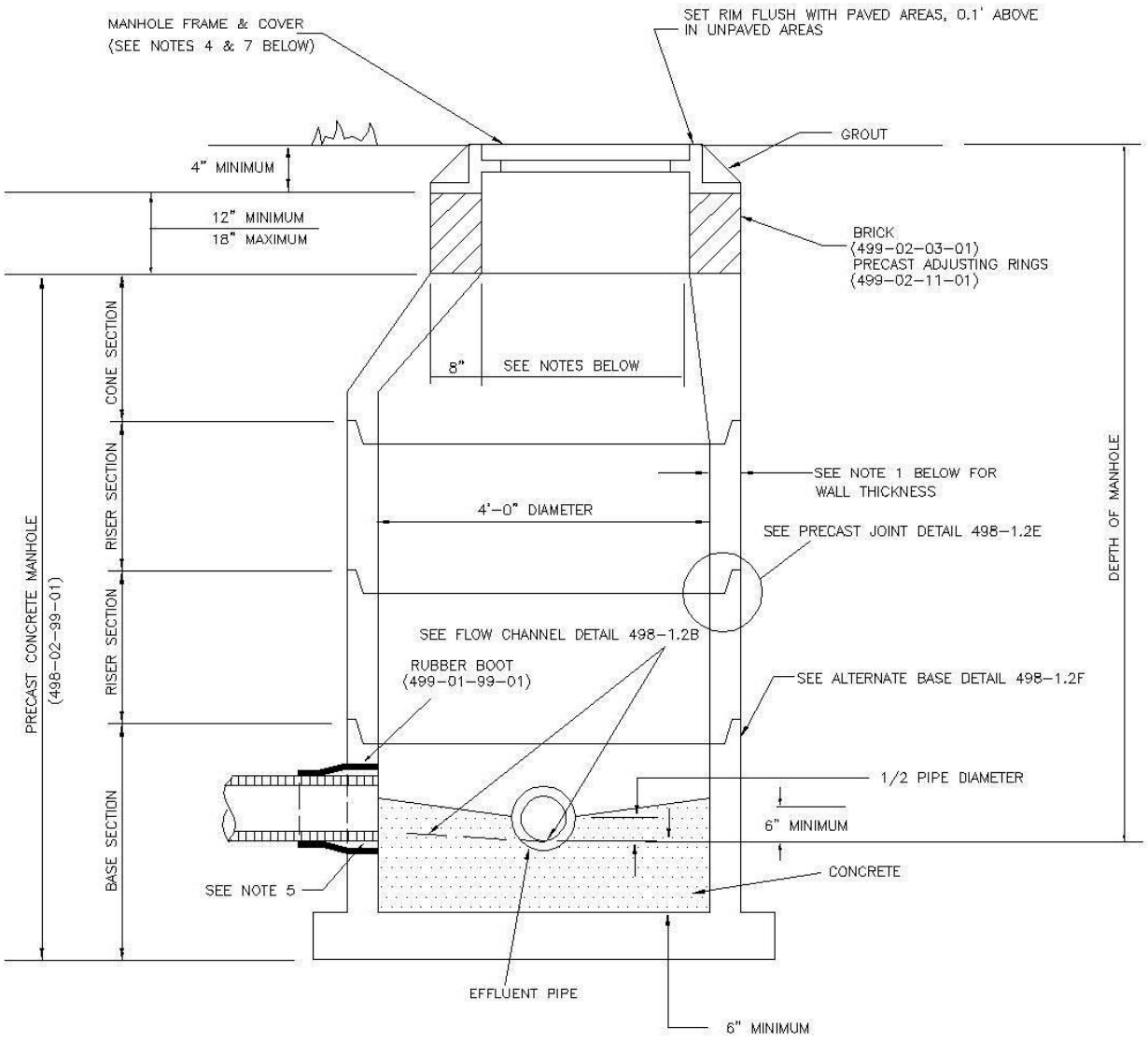


NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") OR 1/12 THE INSIDE DIAMETER, WHICHEVER IS GREATER.
2. ALL MANHOLES TO BE MAINTAINED BY THE CITY SHALL BE LINED. THE LINING SHALL BE HDPE (499-02-99-06). THE EXTERIOR AREAS SHALL BE COATED WITH TWO (2) COATS OF BITUMASTIC SEALER.
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS (499-01-99-01) TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH A STANDARD 24" RING AND COVER UNLESS OTHERWISE SPECIFIED.
5. FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH MANHOLE WALLS.
6. MANHOLE COVER IN PAVED ROADWAY SHALL BE STANDARD UNLESS OTHERWISE SPECIFIED (499-02-09-01).
7. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST PER 491.4.1.1 IN SPECIFICATIONS, 100% STANDARD PROCTOR.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

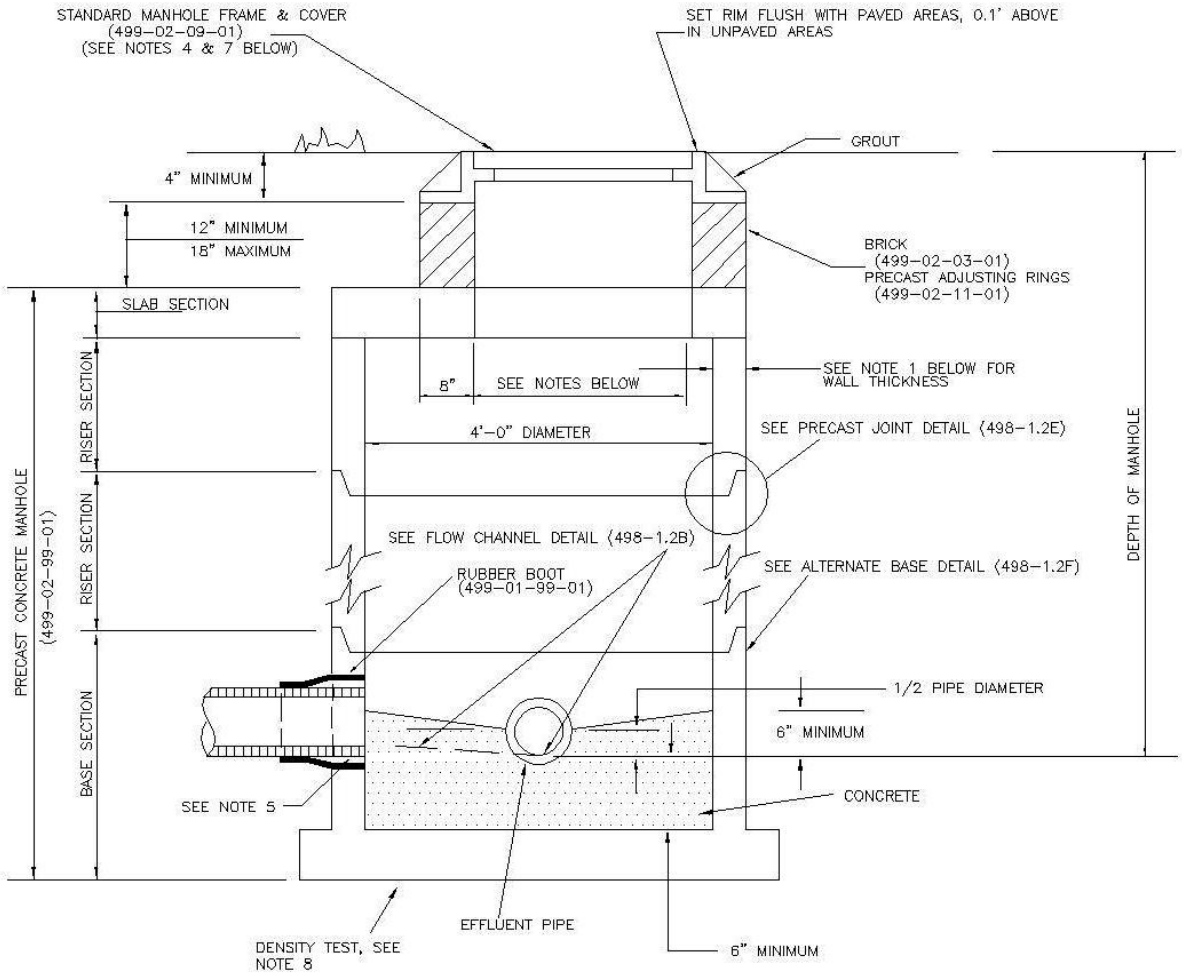
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	PRECAST CONCRETE MANHOLE LESS THAN 5' DEPTH	A 498-1.1



NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") OR 1/12 THE INSIDE DIAMETER, WHICHEVER IS GREATER.
2. ALL MANHOLES THAT WILL BE MAINTAINED BY THE CITY OF VALDOSTA SHALL BE LINED.
   MANHOLE LINING SHALL BE HDPE (499-02-99-06).
   THE EXTERIOR AREAS SHALL BE COATED WITH TWO (2) COATS OF BITUMASTIC SEALER.
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS (499-01-99-01) TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH 24" STANDARD RING AND COVER UNLESS OTHERWISE SPECIFIED.
5. FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH MANHOLE WALL.
6. LIMEROCK WILL BE PLACED AROUND RING & COVER TO BOTTOM OF ASPHALT.
7. MANHOLE COVERS IN PAVEMENT SHALL BE STANDARD OR HINGED (499-02-09-03) WHERE SPECIFIED.
8. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST PER 491.4.1.1 IN SPECIFICATIONS, 100% STANDARD PROCTOR.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	PRECAST CONCRETE MANHOLE 5' TO 12' DEPTH	B 498-1.1

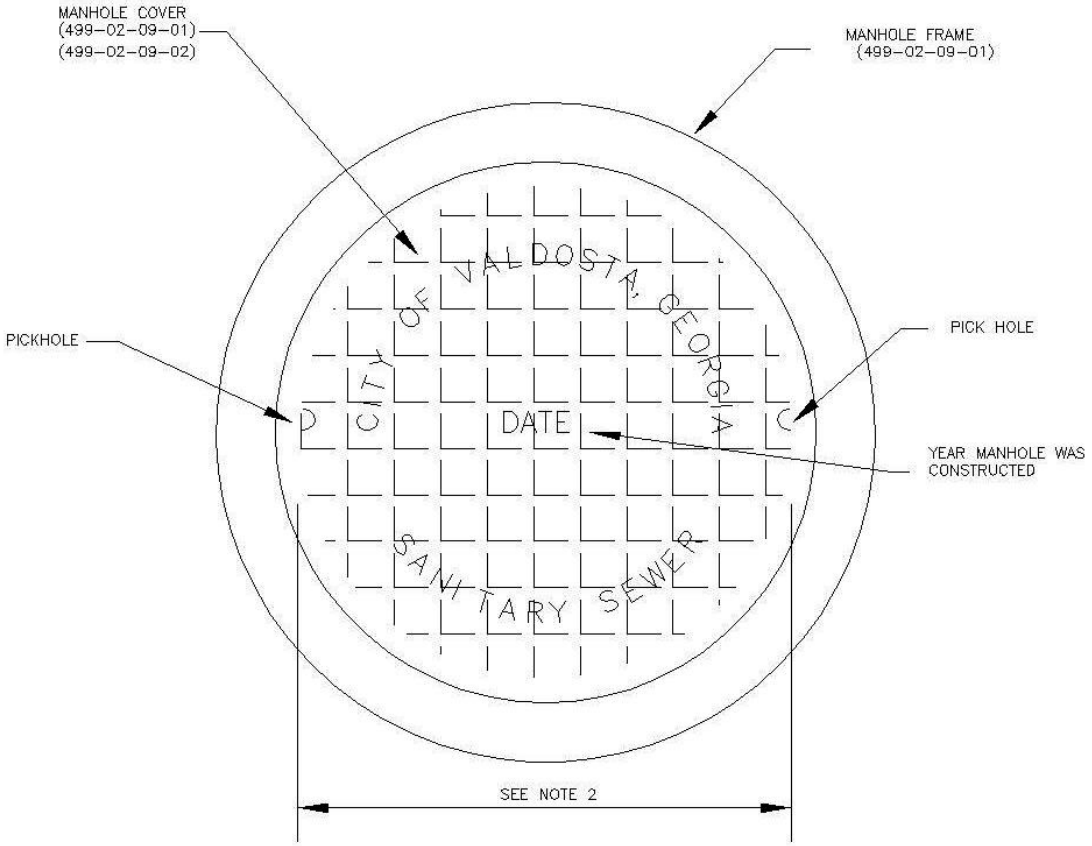


NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") TO A DEPTH OF TEN FEET (10'). WALL THICKNESS SHALL BE INCREASED TO TO EIGHT INCHES (8") AT TEN FEET BELOW GRADE.
2. THE EXTERIOR AREAS SHALL BE COATED WITH TWO (2) COATS OF BITUMASTIC SEALER. ALL MANHOLES MAINTAINED BY THE CITY OF VALDOSTA SHALL BE LINED. LINING SHALL BE HDPE (499-02-99-06).
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS (499-01-99-01) TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH 32" OR 36" STANDARD RING AND COVER UNLESS OTHERWISE SPECIFIED.
5. FILL ANNULAR SPACE BETWEEN PIPE AND BOOT WITH GROUT AND FLUSH WITH WALL OF MANHOLE.
6. LIMEROCK WILL BE PLACED AROUND RING AND COVER TO BOTTOM OF ASPHALT.
7. MANHOLE COVERS IN PAVED ROADWAYS SHALL BE STANDARD (499-02-09-01).
8. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST PER 491.4.1.1 IN SPECIFICATIONS 100% STANDARD PROCTOR.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	PRECAST CONCRETE MANHOLE OVER 12' DEPTH	C
			498-1.1

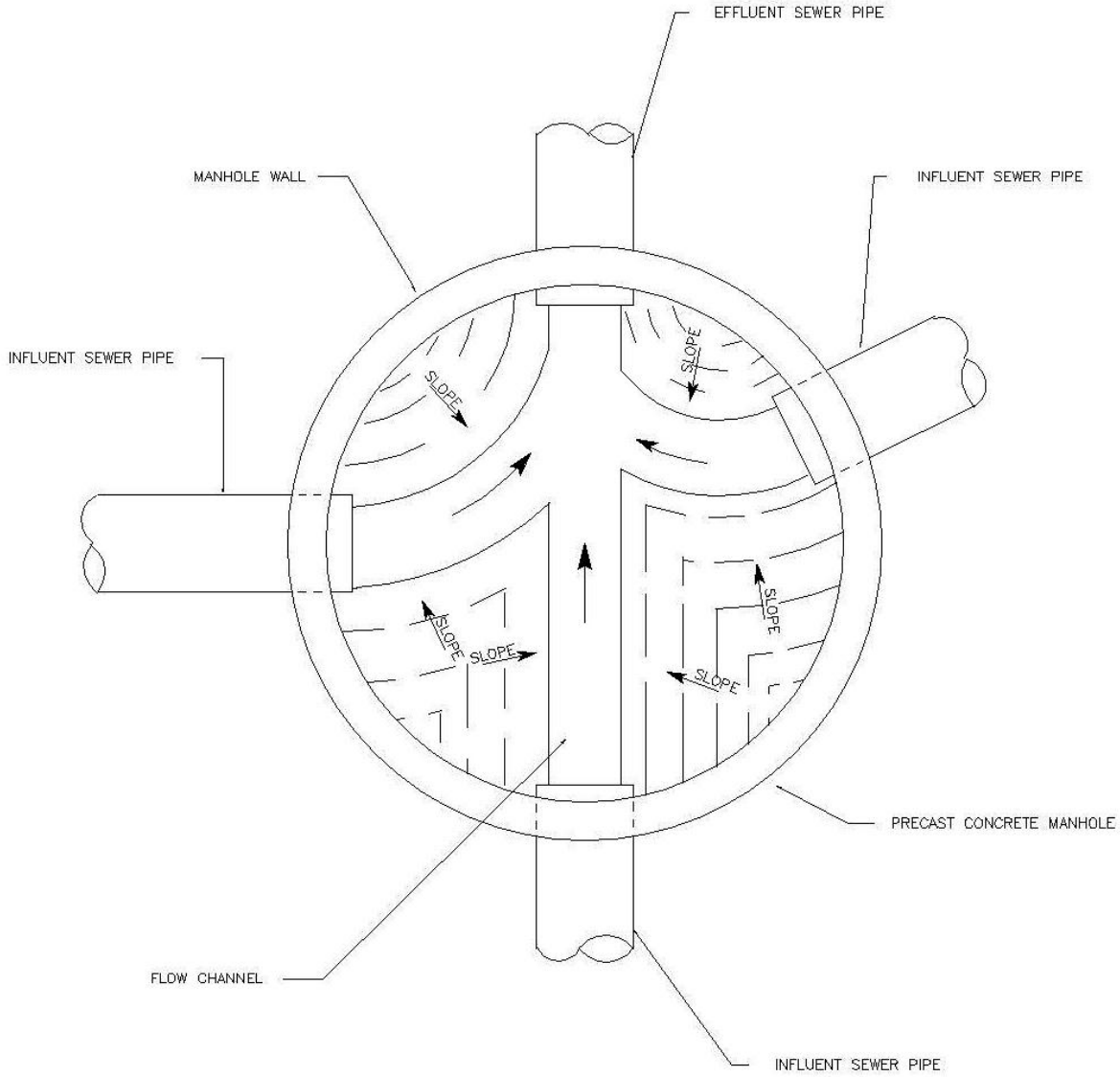


NOTES

1. MANHOLE COVER SHALL BE LETTERED WITH THE WORDS "CITY OF VALDOSTA, GEORGIA" ACROSS THE TOP, "SANITARY SEWER" ACROSS THE BOTTOM AND THE YEAR OF THE MANUFACTURE IN CENTER.

2. UNLESS OTHERWISE SPECIFIED MANHOLE COVERS SHALL BE 24" DIAMETER, AND DOUBLE COVERS DEPENDING ON DEPTH. 32" DIAMETER.

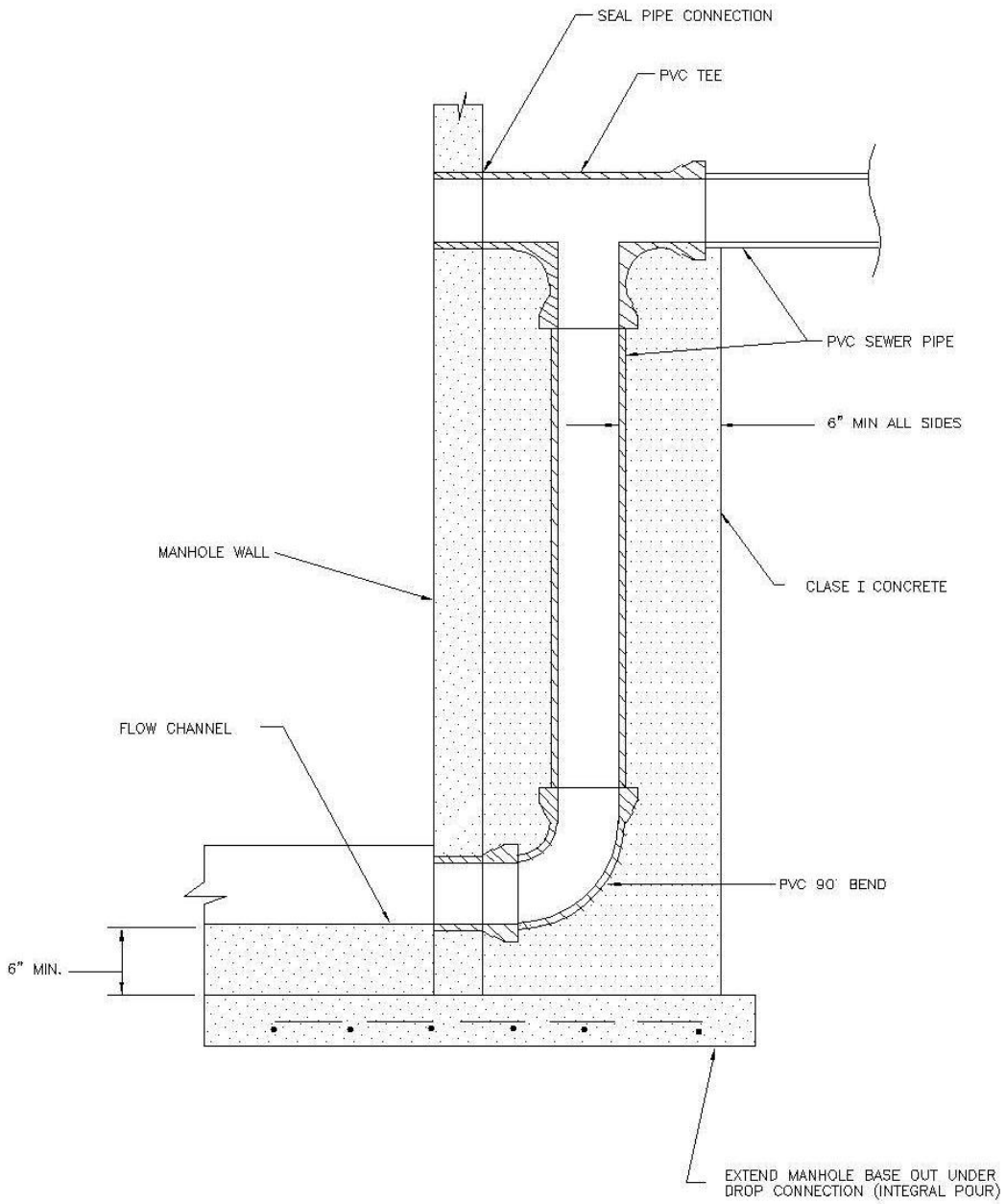
SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 2
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER MANHOLE COVER	A 498-1.2



NOTES

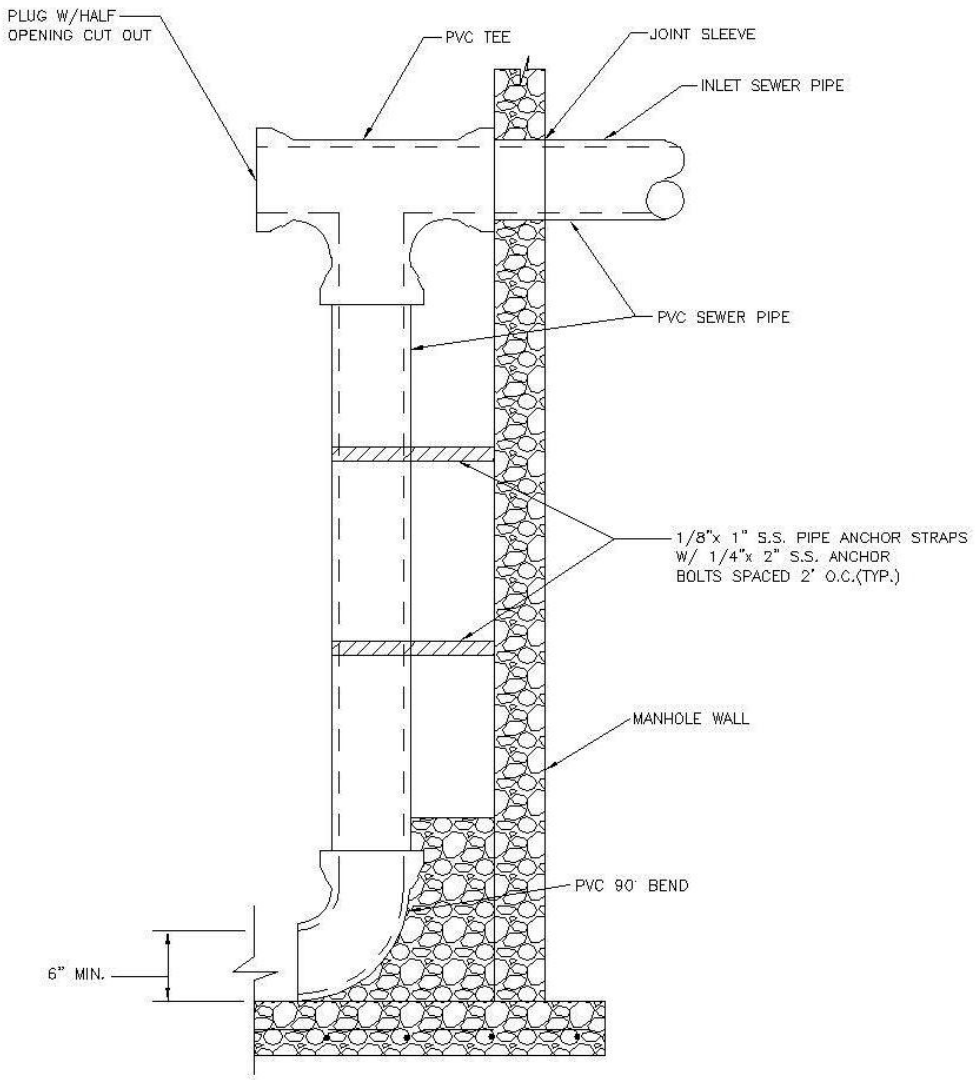
1. FLOW CHANNELS IN MANHOLE BOTTOM SHALL HAVE SAME RADIUS AS EFFLUENT SEWER LINES.
2. FLOW CHANNELS SHALL BE FORMED OF CLASS I CONCRETE. ALL INVERTS SHALL FOLLOW THE GRADES OF THE PIPE ENTERING THE MANHOLE. BRICKS OR OTHER FILL MATERIALS SHALL NOT BE USED WHEN FORMING FLOW CHANNELS.
3. THAT PORTION OF THE FLOW CHANNEL ABOVE THE SLOPED SIDES SHALL BE FREE OF COVERING TO THE LIMITS SHOWN ABOVE.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER MANHOLE FLOW CHANNEL	B 498-1.2



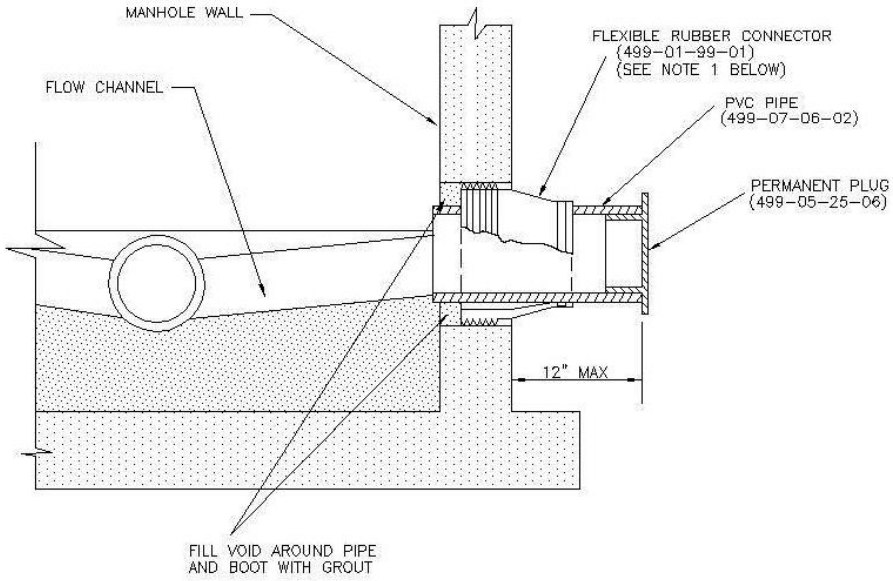
SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER MANHOLE DROP CONNECTION	C 498-1.2



SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER MANHOLE INSIDE DROP CONNECTION	C2 498–1.2

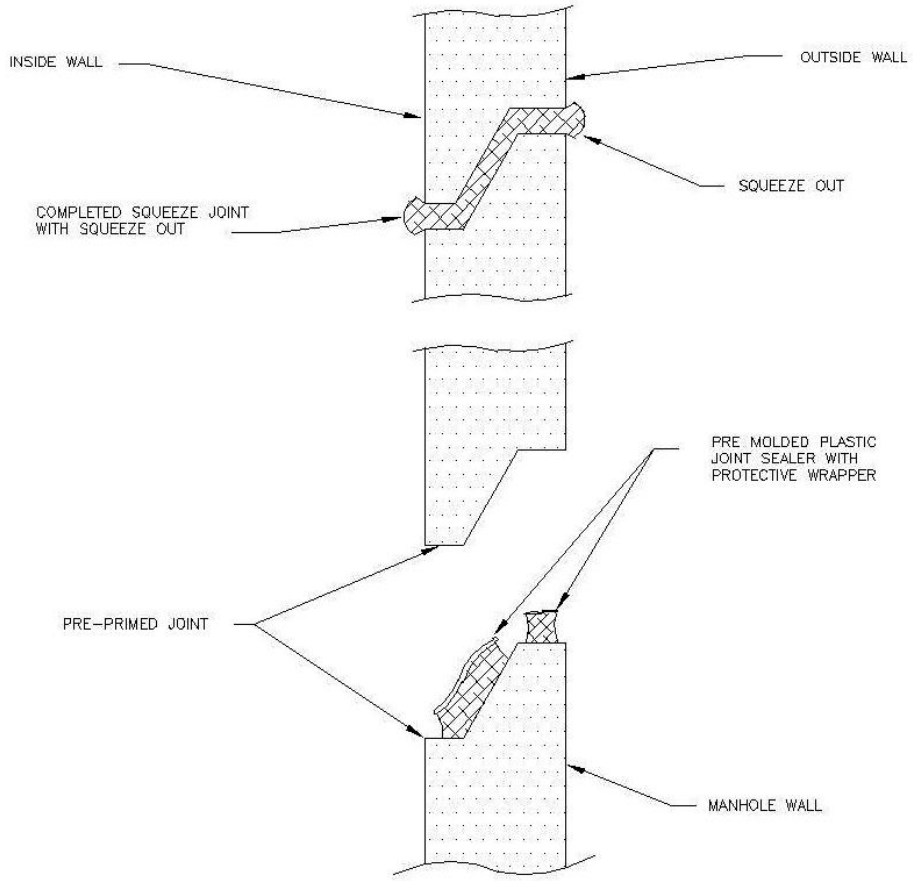


NOTES

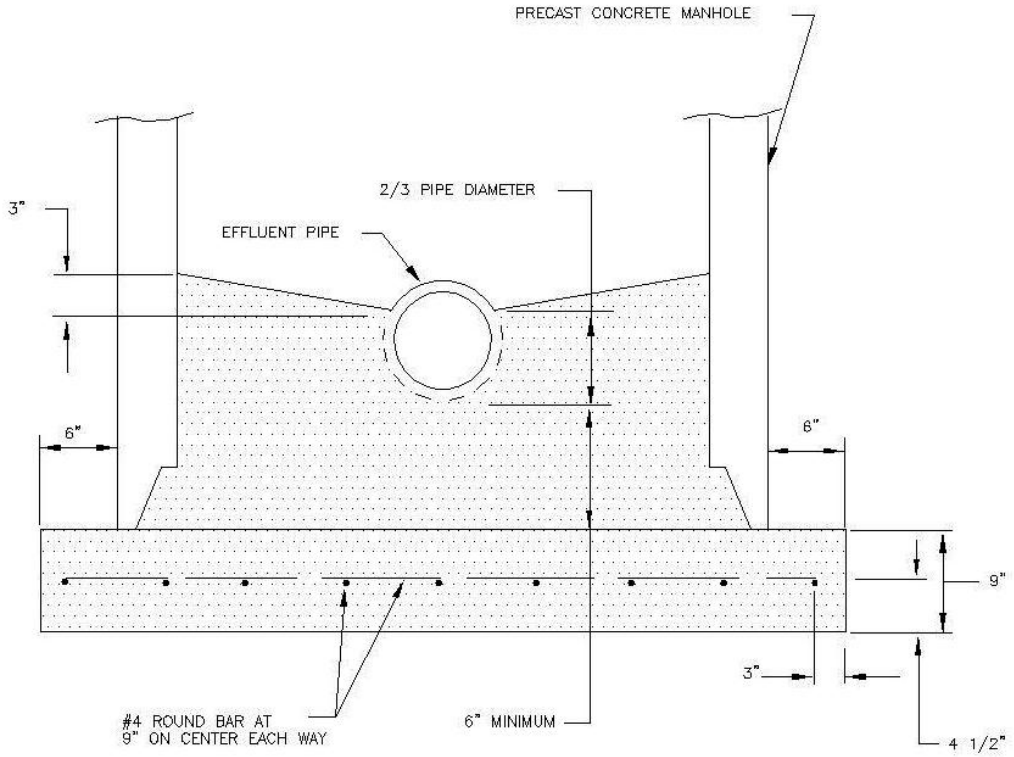
1. BOOTS SHALL BE INSTALLED BY THE MANUFACTURER OF THE PRECAST MANHOLE IN ACCORDANCE WITH THE BOOT MANUFACTURERS INSTRUCTIONS.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER MANHOLE STUBOUT	D 498-1.2

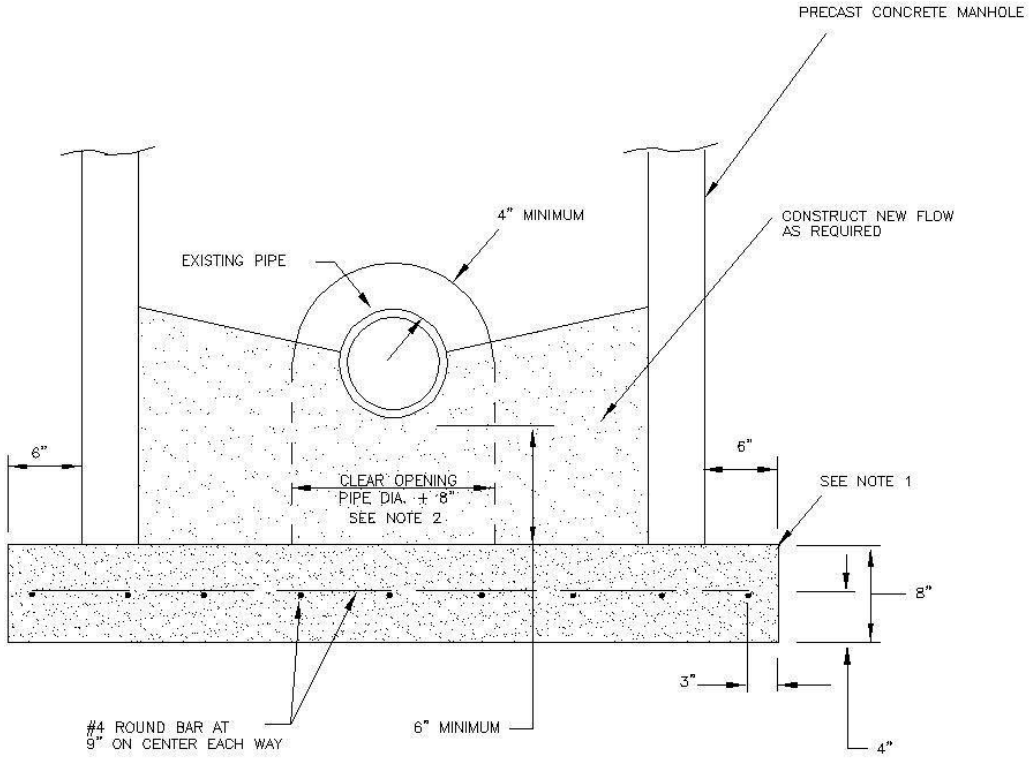


SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	PRECAST CONCRETE MANHOLE JOINT CONSTRUCTION	E 498-1.2



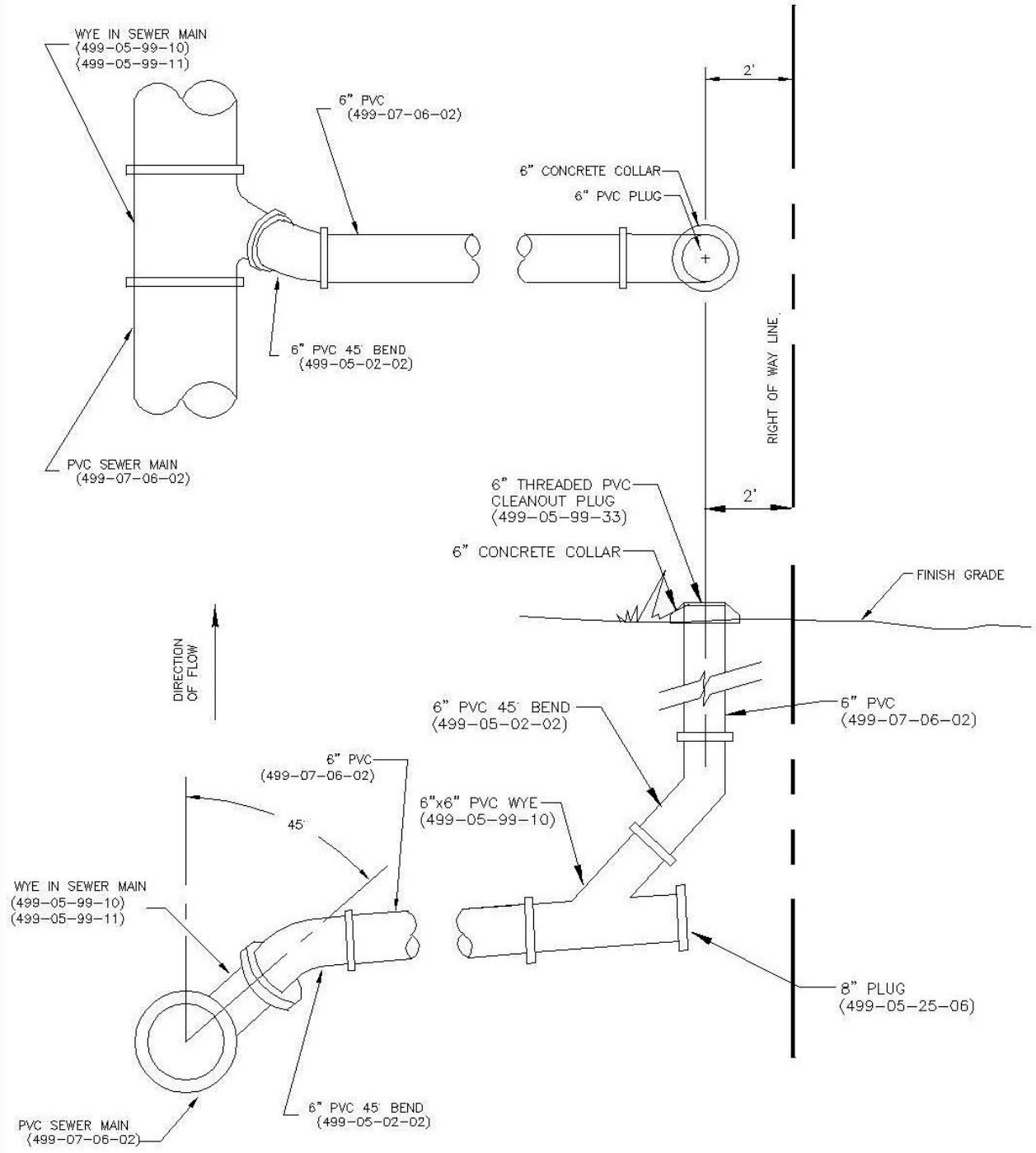
SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	PRECAST CONCRETE MANHOLE ALTERNATE BASE CONSTRUCTION	F 498–1.2



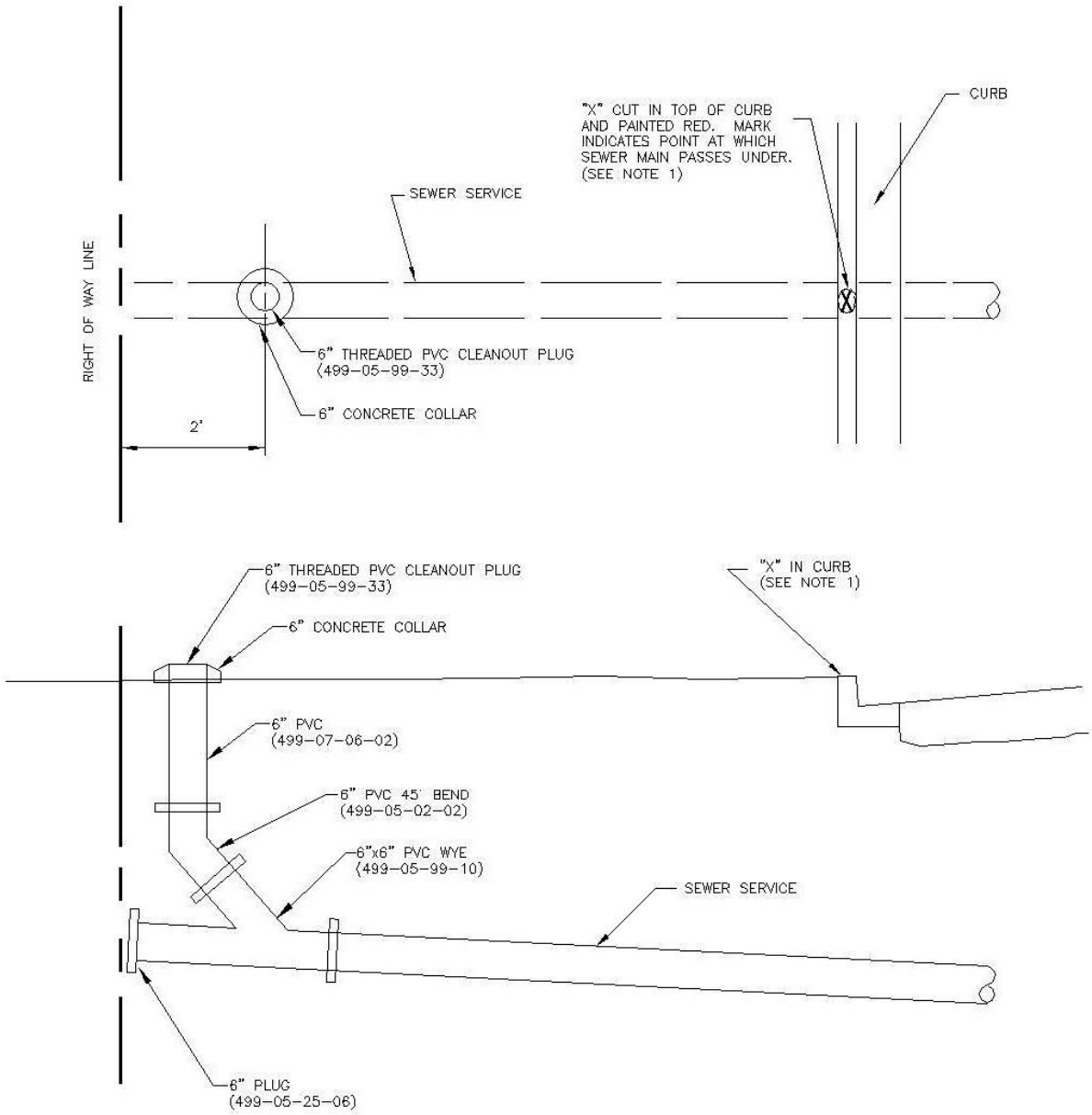
1. MANHOLE BASE CAN BE EITHER CAST IN PLACE AS SHOWN OR PRECAST BY AN APPROVED PRECASTER.
2. FILL VOID WITH BRICK AND GROUT AS APPROVED BY THE CITY ENGINEER.
3. MANHOLE MUST BE LEAK OR AIR TESTED.

SPECIFICATION		DATE REVISED:	SECTION
			SHT. 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	DOGHOUSE MANHOLE BASE CONSTRUCTION	G 498-1.2



SPECIFICATION		DATE REVISED:	SECTION
			SHT. 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER SERVICE SINGLE SEWER SERVICE	A 498-2.1

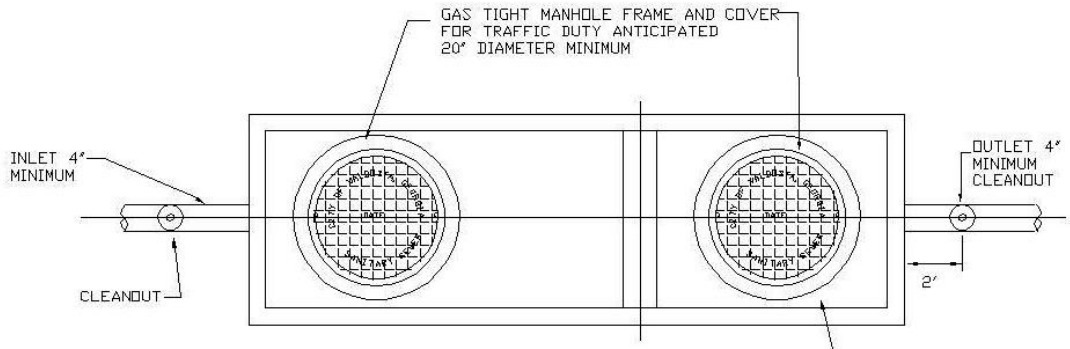


NOTES

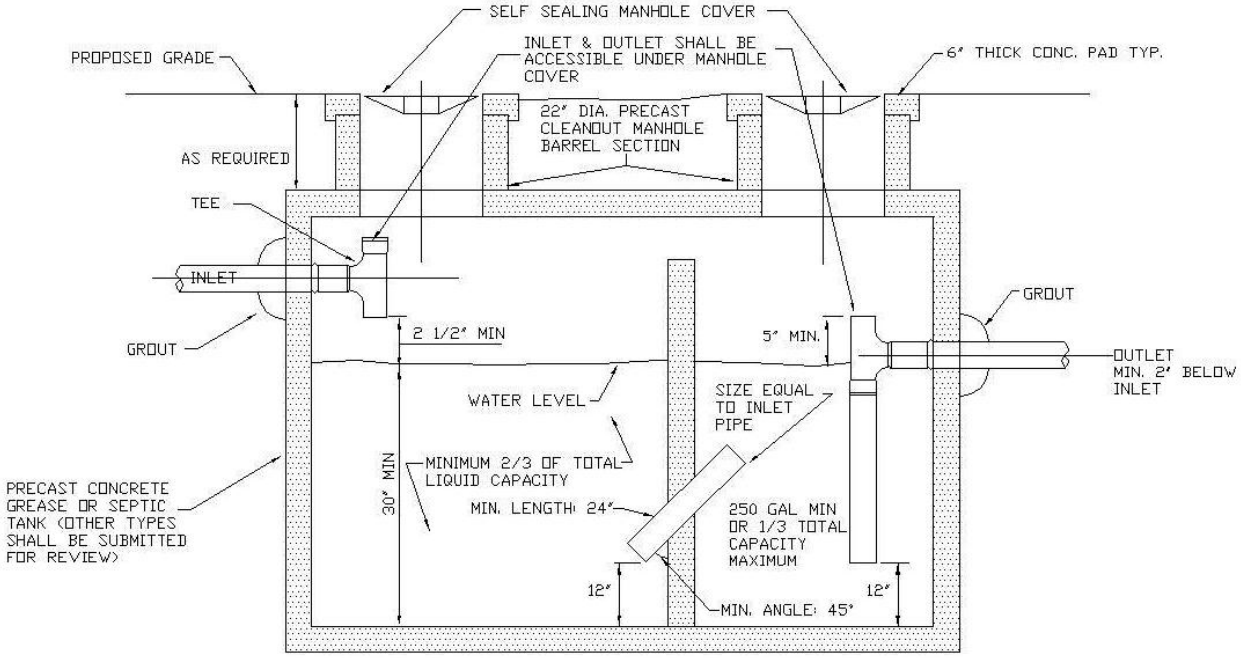
1. WHERE NO CURB AND GUTTER EXIST, THE SEWER SERVICE SHALL BE REFERENCED BY PLACING A NAIL & DISC AND AT THE EDGE OF PAVEMENT.
2. ALL SEWER MAINS SHALL BE TELEVISED ACCURATELY LOCATING WYE LOCATIONS. SEE STANDARD SPECIFICATION 496-3.
3. GRAPHIC ASBUILTS SHALL ACCURATELY LOCATE ALL WYES AND SERVICES. SEE STANDARD SPECIFICATION 496-2.

SPECIFICATION		DATE REVISED:	SECTION
			SHT. 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER SERVICE SERVICE REFERENCING	C 498-2.1



TOP VIEW



SECTION

DESIGN CALCULATIONS		
RESTAURANTS (S)x(20)x(HR/12)x(LF)=CAPACITY IN GALLONS (S) = NUMBER OF SEATS IN DINING AREA (HR) = NUMBER OF HOURS ESTABLISHMENT IS OPEN (LF) = LOADING FACTIOR-(1.25 WITH INTERSTATE HIGHWAYS, 1.0 OTHER FREEWAYS, 1.00 RECREATIONAL AREAS, 0.8 MAIN HIGHWAYS AND 1.00 OTHERWISE)	OTHER TYPES OF COMMERCIAL KITCHENS (M)x(5)x(LF)=CAPACITY IN GALLONS (M) = MEALS PER DAY (LF) = LOADING FACTOR-(1.0 WITH DISHWASHER, 0.05 WITHOUT DISHWASHER)	SHOPPING CENTERS AND MIXED USE 1,000 GALLONS FOR THE FIRST 46 SEATS AND 500 ADDITIONAL GALLONS FOR EACH ADDITIONAL 23 SEATS.

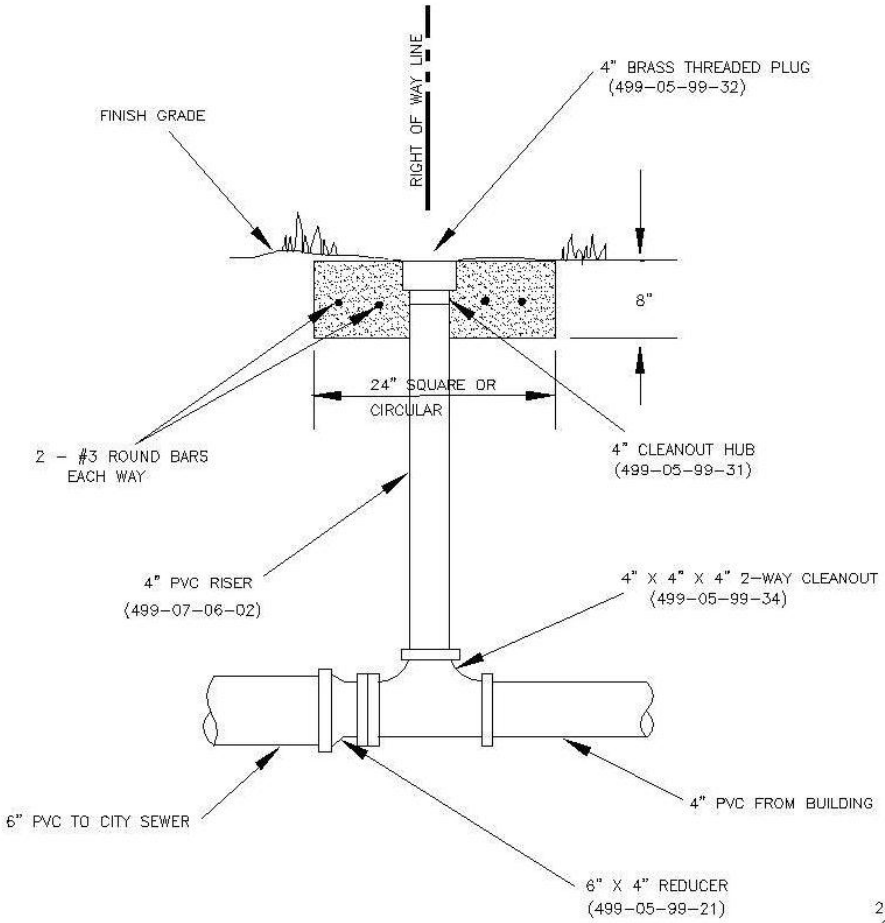
NOTE

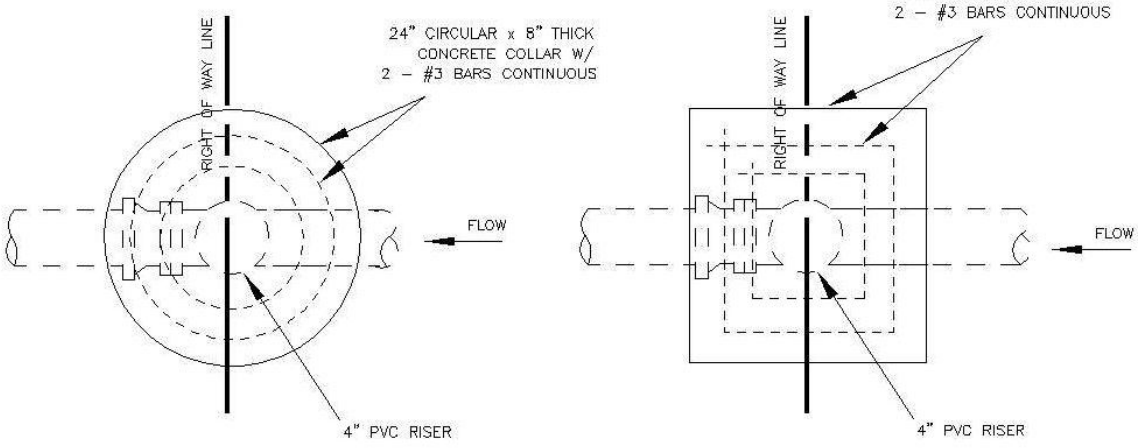
1. ACCESS FOR MONITORING THE INLET AND OUTLET PIPE FITTINGS OR BAFFLES SHALL BE PROVIDED FROM MANHOLES. CLEANOUTS SHALL BE INSTALLED BEFORE THE FIRST GREASE INTERCEPTOR AND WITHIN TWO FEET AFTER THE LAST INTERCEPTOR IN THE SERIES.
2. GREASE INTERCEPTOR (OR INTERCEPTORS) SHALL BE DESIGNED TO PRODUCE A CLARIFIED EFFLUENT ACCEPTABLE TO CITY OF VALDOSTA STANDARDS

GREASE INTERCEPTOR DETAIL

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	GREASE INTERCEPTOR SEPARATOR	A
			498-2.2



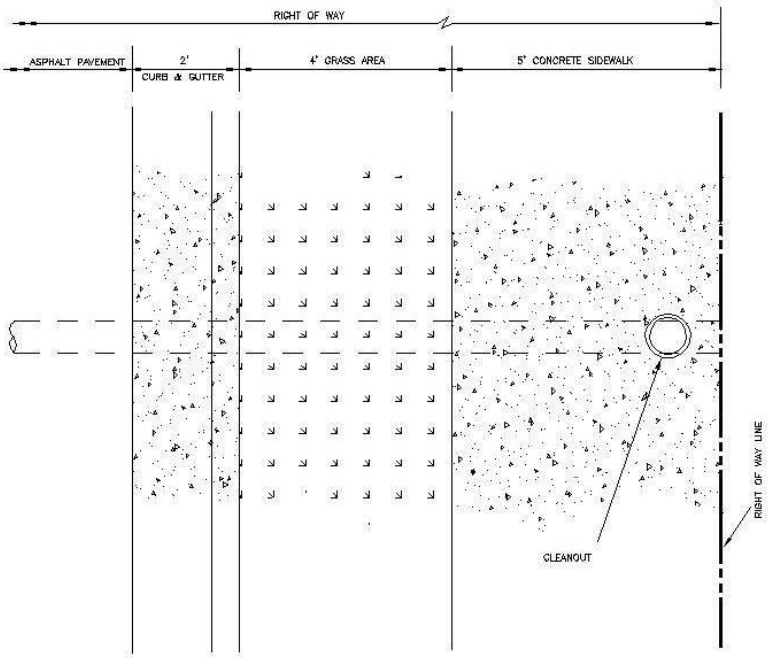


24" CIRCULAR

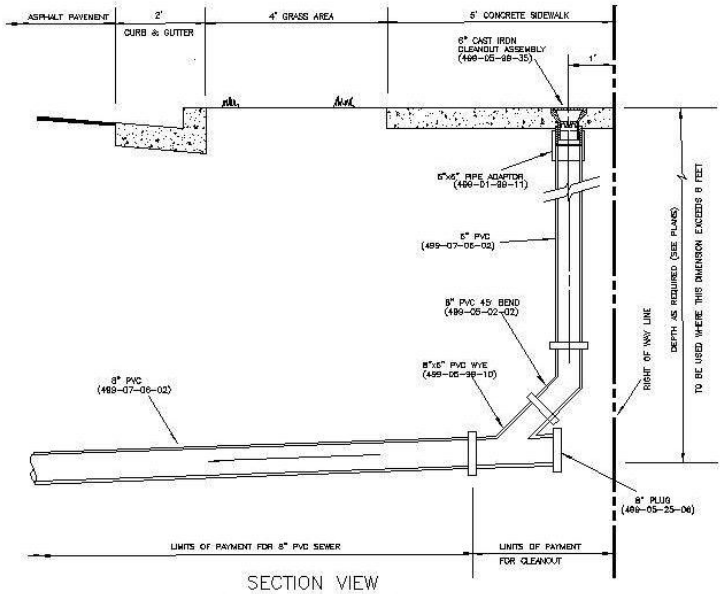
24" SQUARE

NOTES:
1. PRECAST CONCRETE CLEANOUT RING CAN BE USED.

SPECIFICATION REVISIONS												DATE REVISED:					SECTION SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER SERVICE RESIDENTIAL CLEANOUT															B 498-2.2



PLAN VIEW

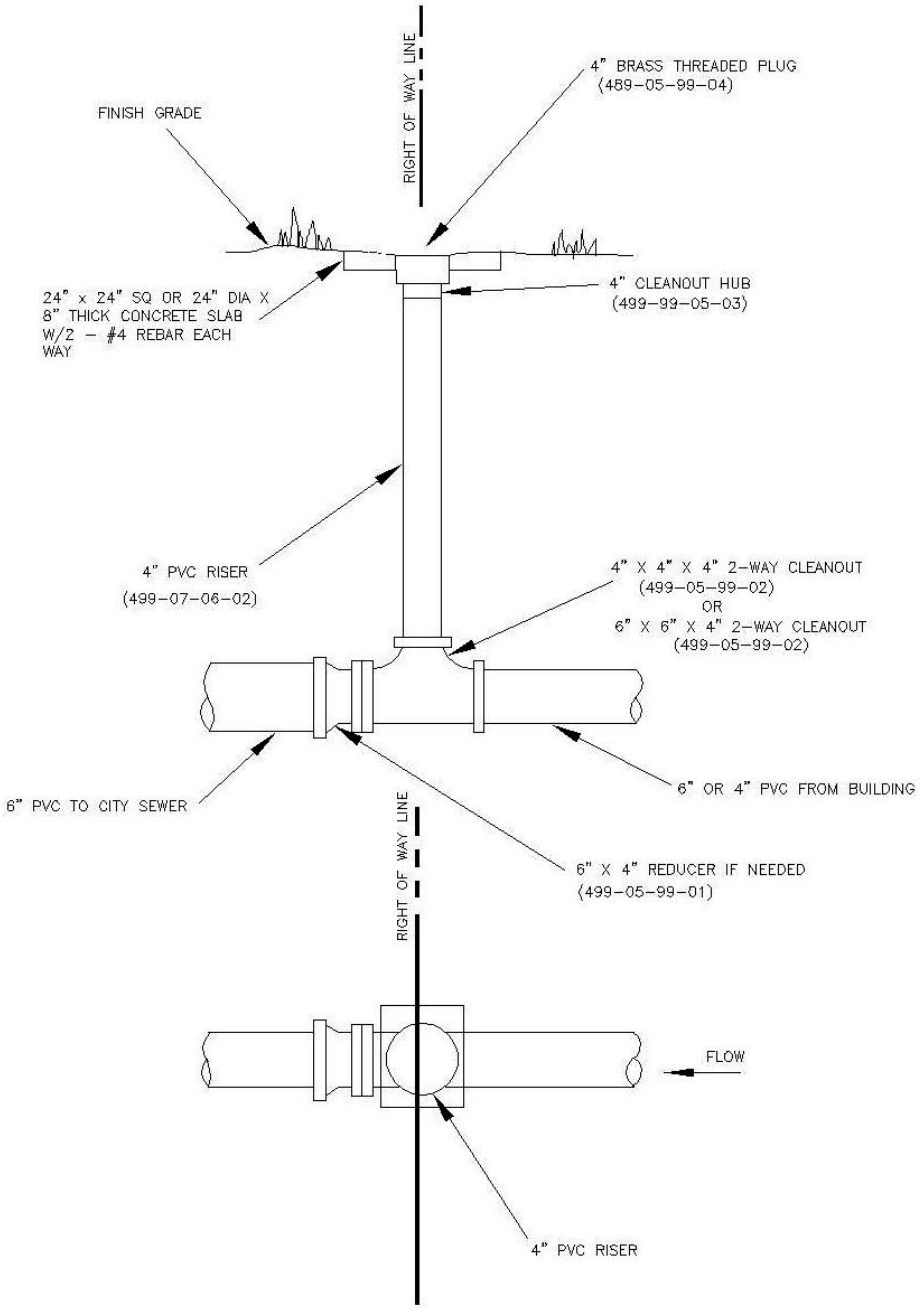


SECTION VIEW

NOTES

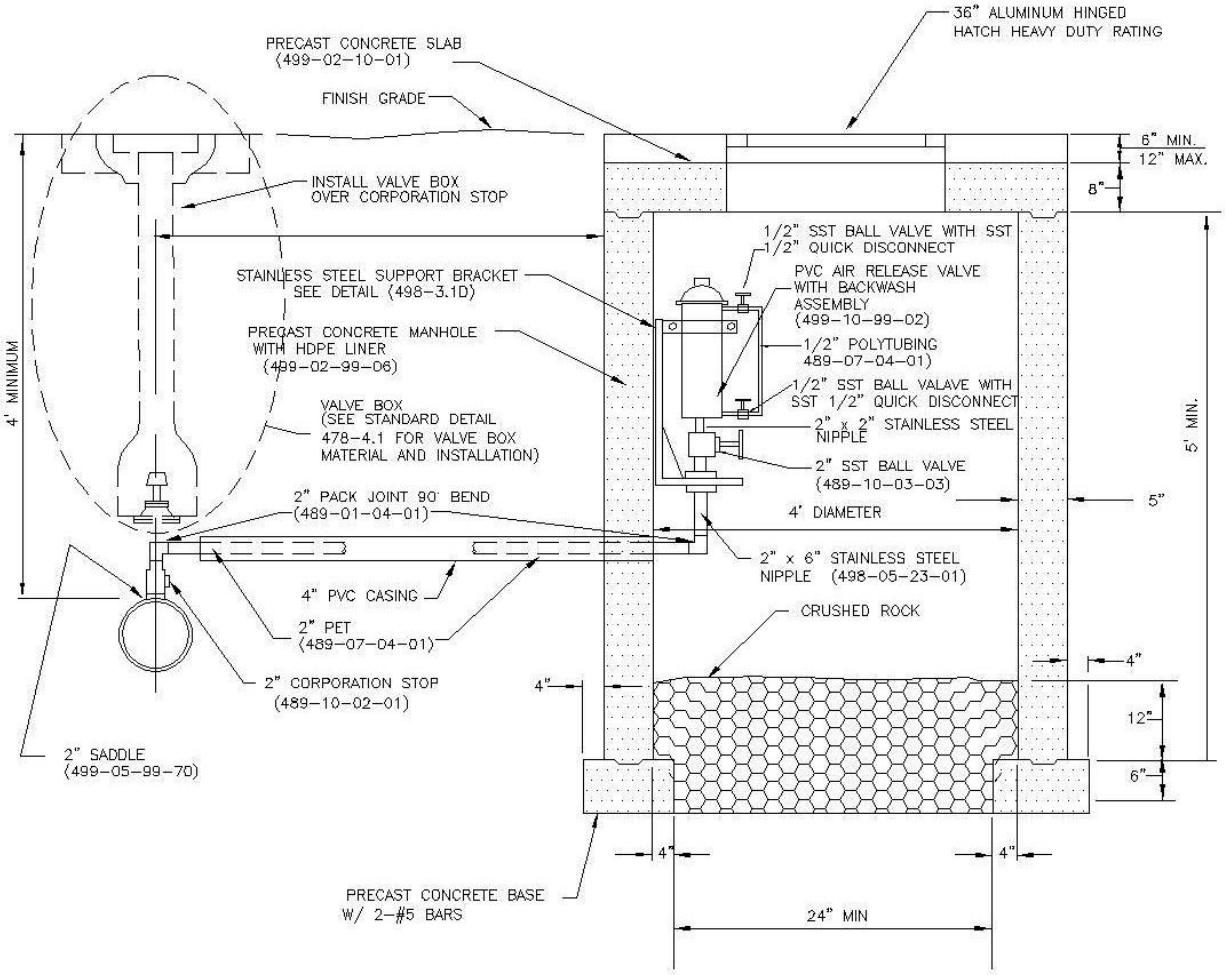
1. CLEANOUT INCLUDES 8"x6" WYE, 6"x45° BEND, CLEANOUT ASSEMBLY, 6" PVC, PIPE ADAPTOR, AND 8" PLUG.
2. IF NO SIDEWALK PLACE 24" SQ OR 24" DIA x 8" THICK SLAB WITH 2 – #3 REBAR EACH WAY

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER STUBOUT	C
			498-2.2



1. ALL CLEANOUTS ON SITE NEED TO HAVE CONCRETE PADS.

SPECIFICATION REVISIONS												DATE REVISED:					SECTION SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	SANITARY SEWER SERVICE COMMERCIAL CLEANOUT															D 498-2.2

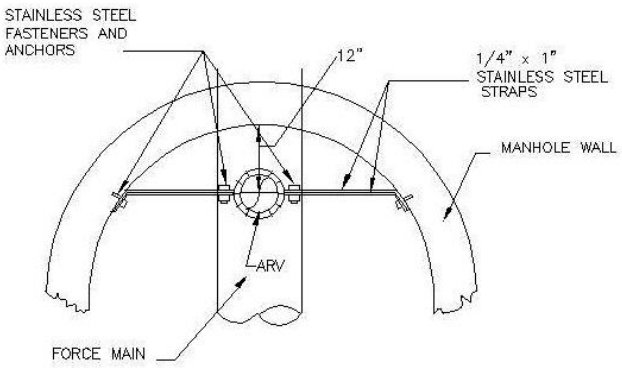


NOTES

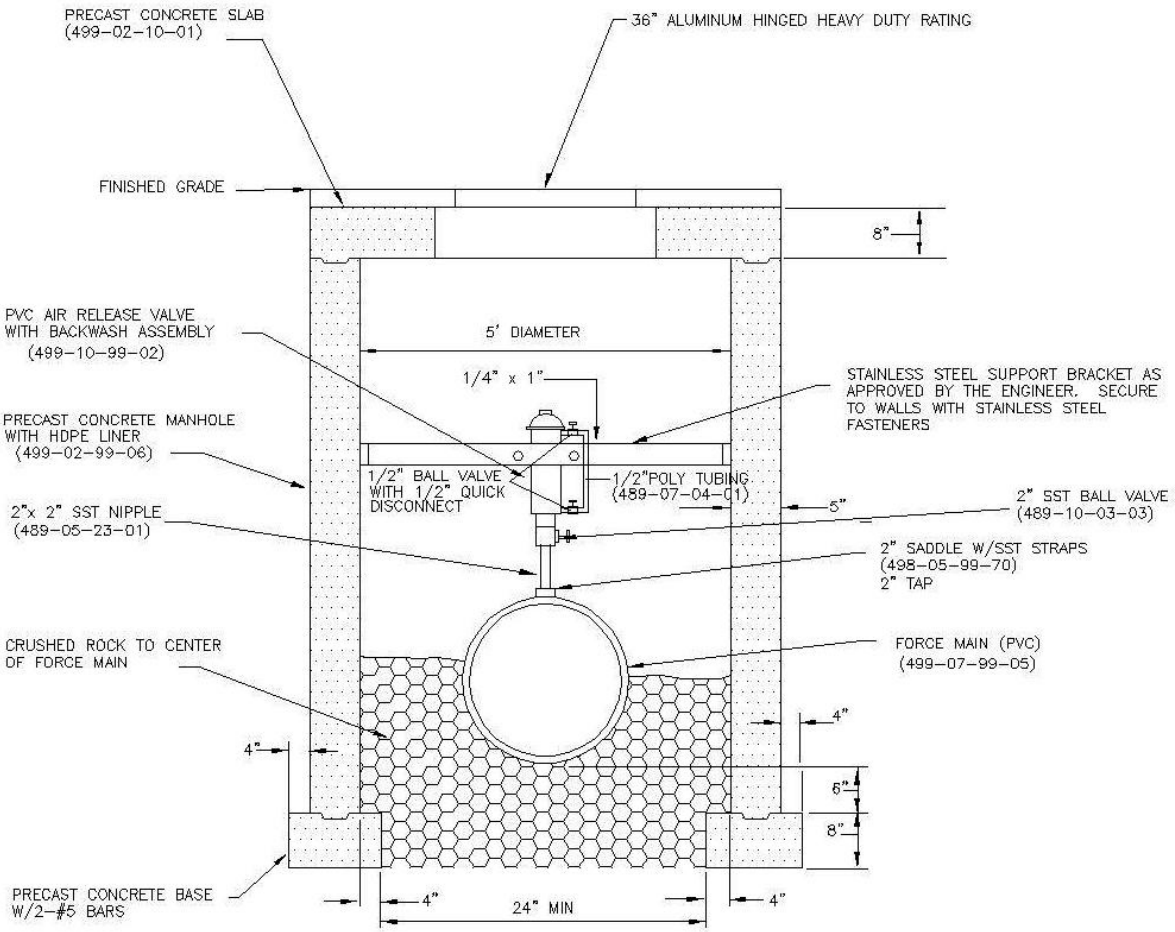
1. MANHOLE WALLS SHALL BE LINED AS SPECIFIED IN SECTION 498-1.1.
2. USE STAINLESS STEEL FASTENERS TO SECURE ARV AND APPURTENANCES.
3. COAT INSIDE OF MANHOLE RIM AND COVER WITH EPOXY CEMENT AS SPECIFIED.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	AIR RELEASE VALVE ASSEMBLY DISCHARGE TO NEW MANHOLE	A 498-3.1



PLAN VIEW

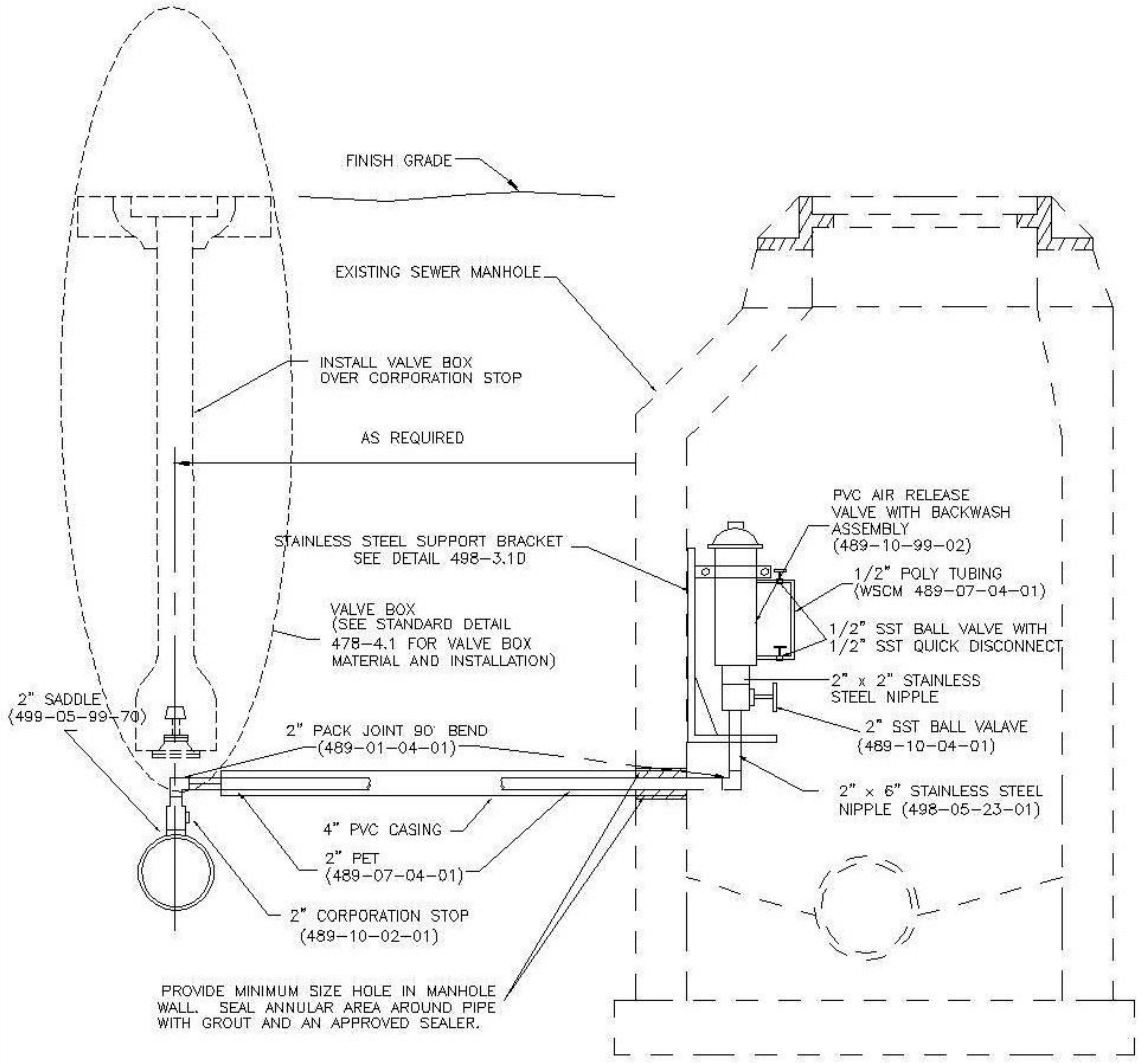


NOTES

1. MANHOLE WALLS SHALL BE LINED AS SPECIFIED IN SECION 498-1.1.
2. USE STAINLESS STEEL FASTENERS TO SECURE ARV AND APPURTENANCES.
3. FOR DIP FORCE MAINS COAT OUTSIDE EXPOSED AREA OF FORCE MAIN WITH EPOXY COATING (499-11-31-02).
4. LID TO READ SANITARY SEWER FORCE MAIN AIR RELEASE VALVE.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	AIR RELEASE VALVE ASSEMBLY OVER FORCE MAIN	B 498-3.1

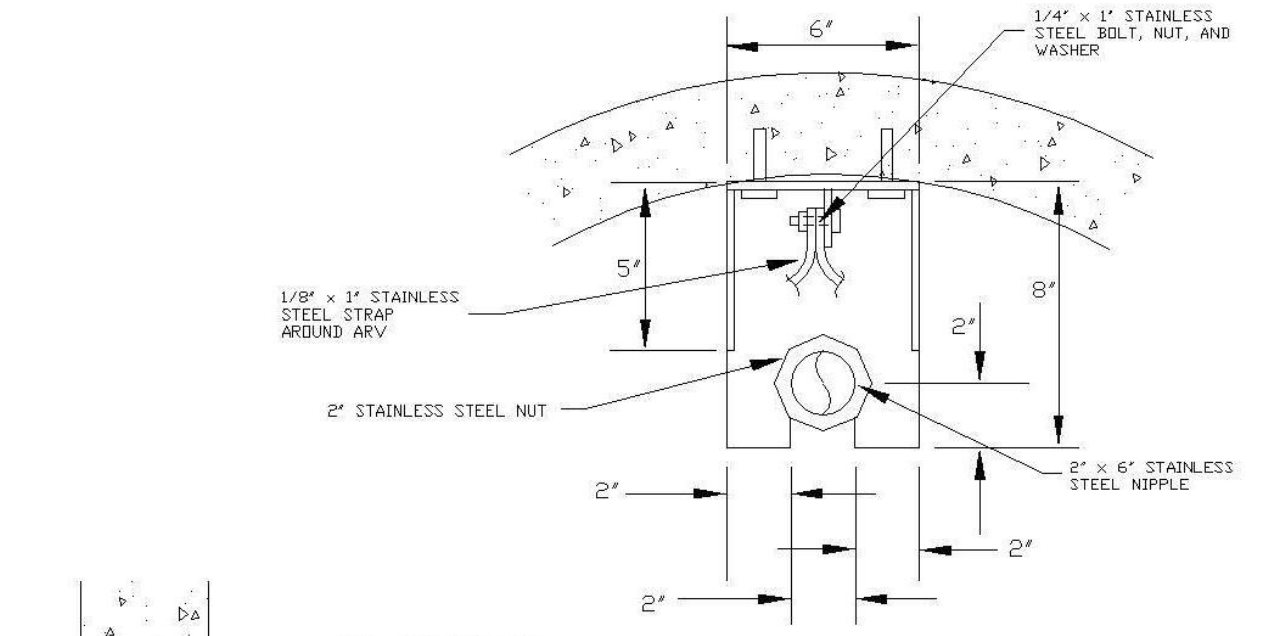


NOTES

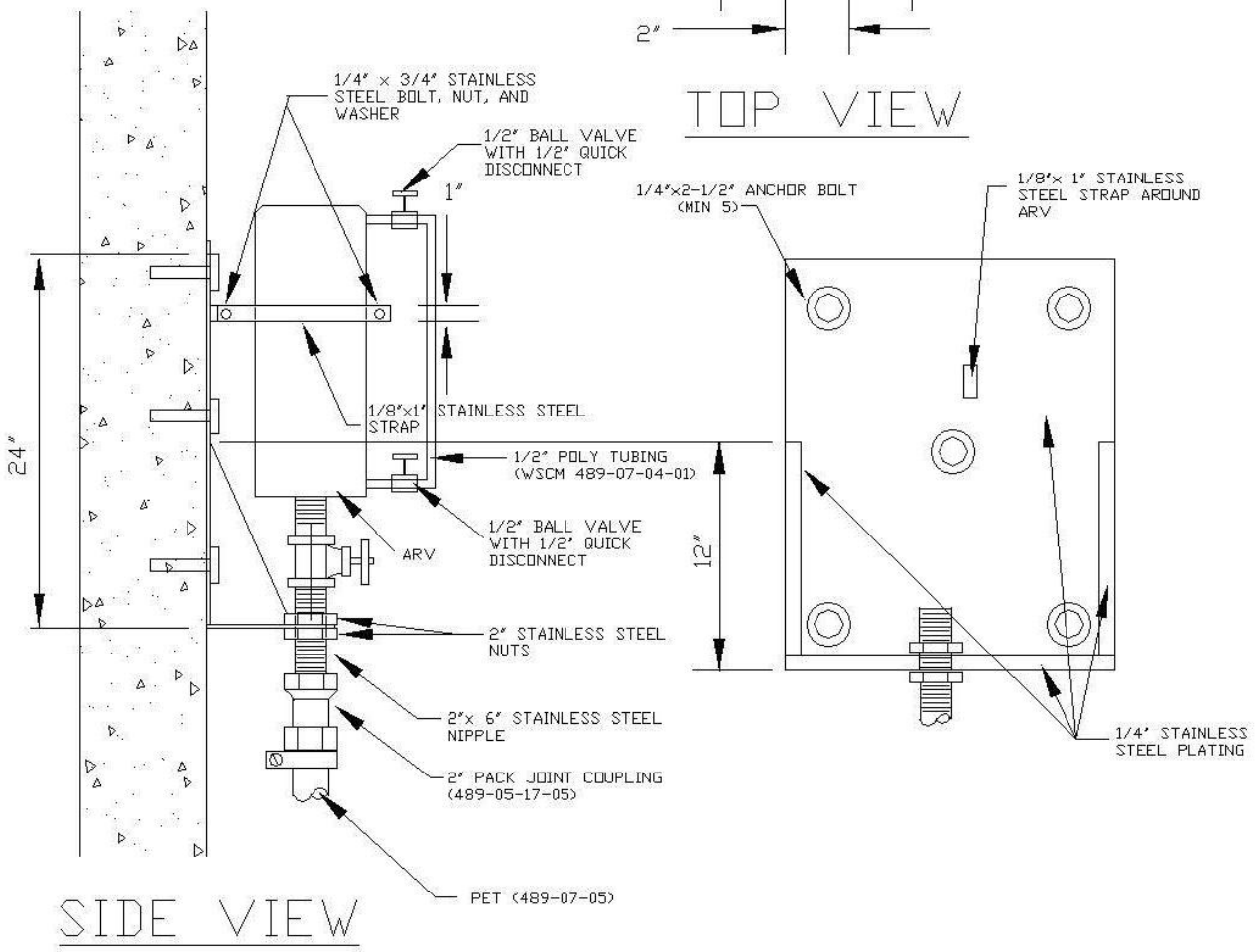
1. MANHOLE WALLS SHALL BE LINER AS SPECIFIED IN SECTION 498-1.1.
2. USE STAINLESS STEEL FASTENERS TO SECURE A.R.V. AND APPURTENANES.
3. COAT INSIDE OF MANHOLE RIM & COVER WITH EXPOX CEMENT AS SPECIFIED.

SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	AIR RELEASE VALVE ASSEMBLY DISCHARGE TO EXISTING MANHOLE	C 498-3.1



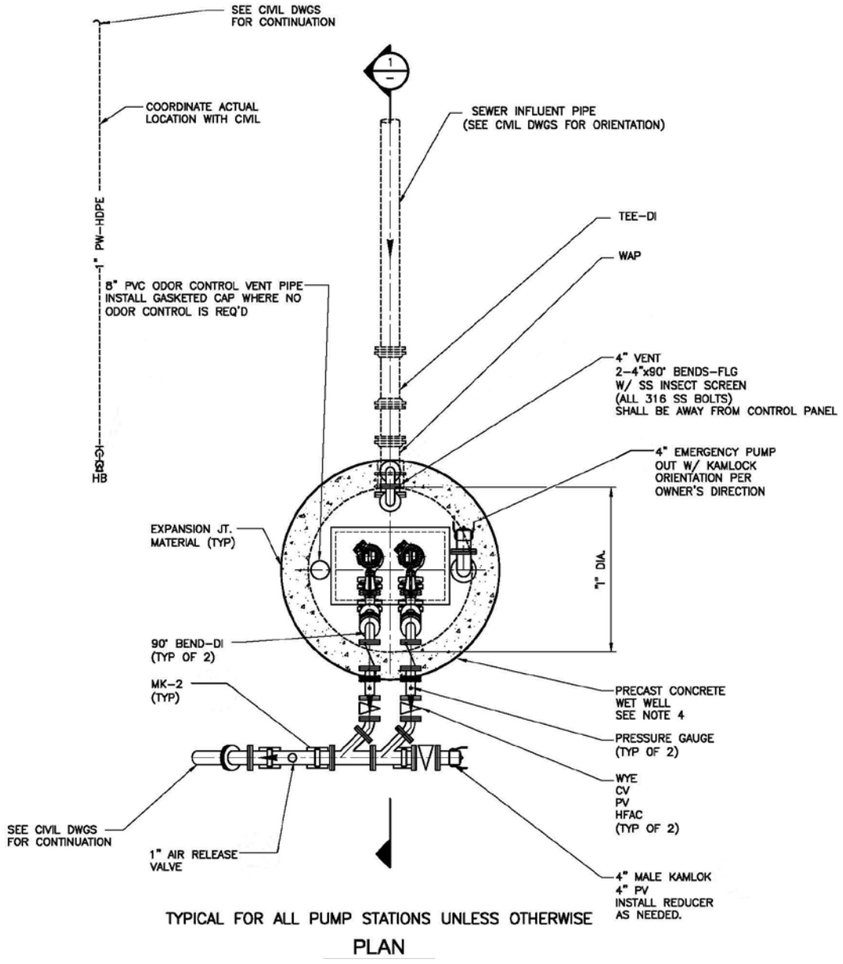
TOP VIEW

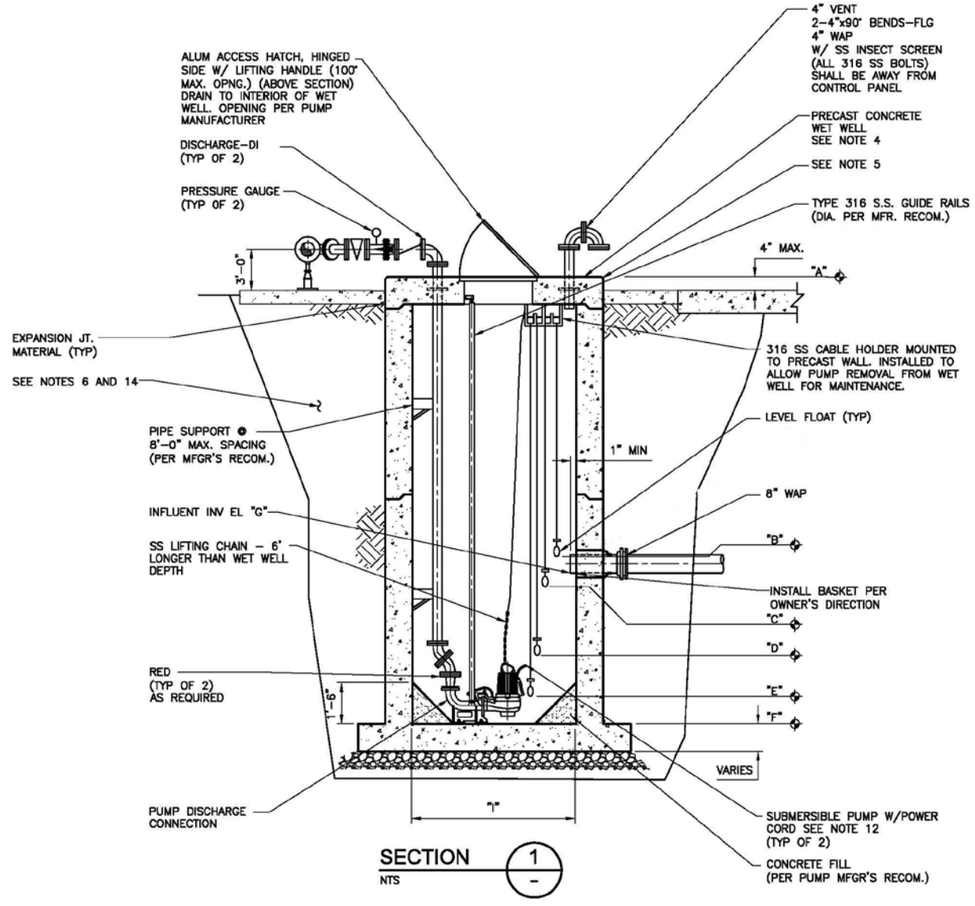


SIDE VIEW

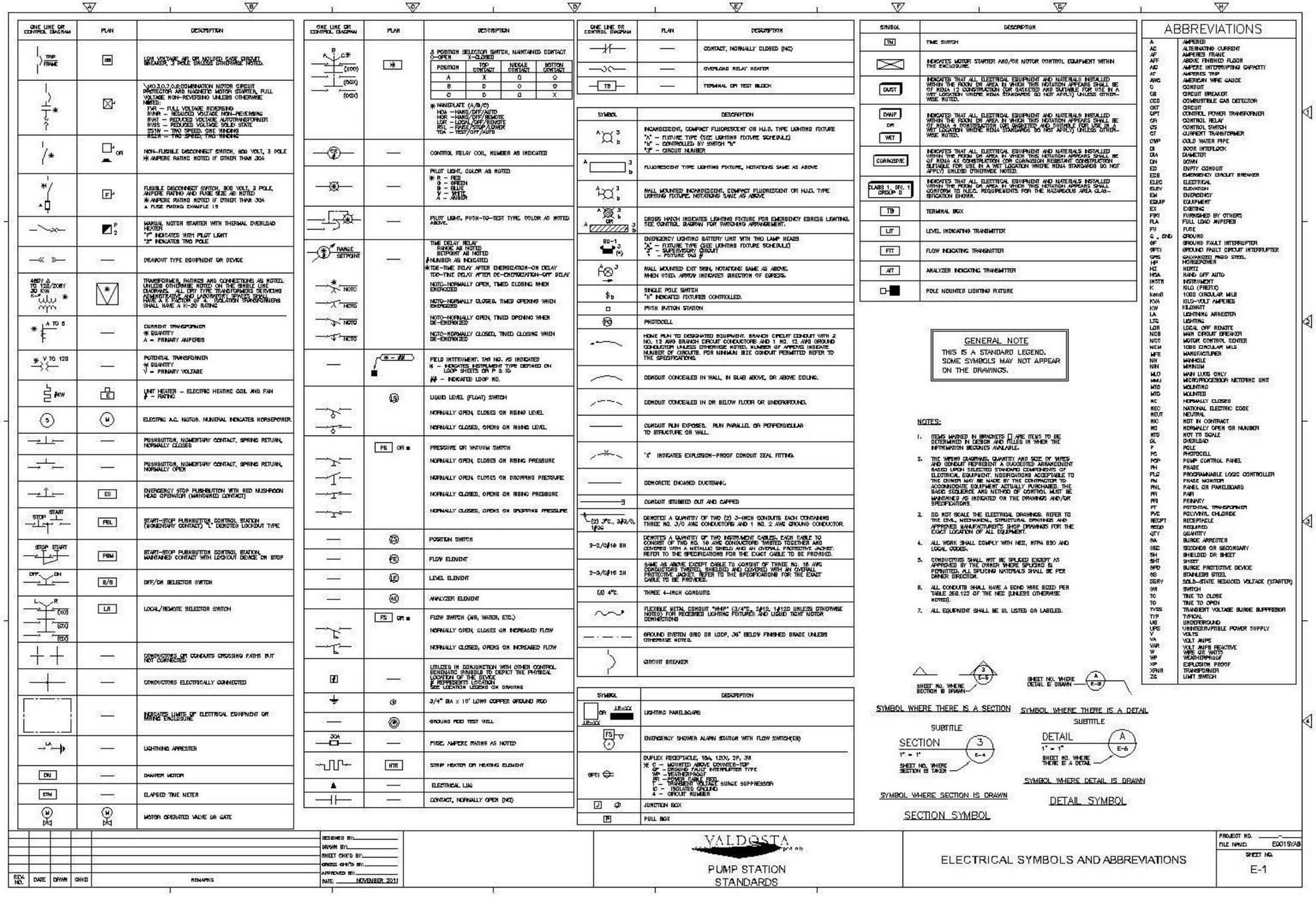
SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1
CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	AIR RELEASE VALVE ASSEMBLY SUPPORT BRACKET	D 498-3.1

City of Valdosta Lift station details



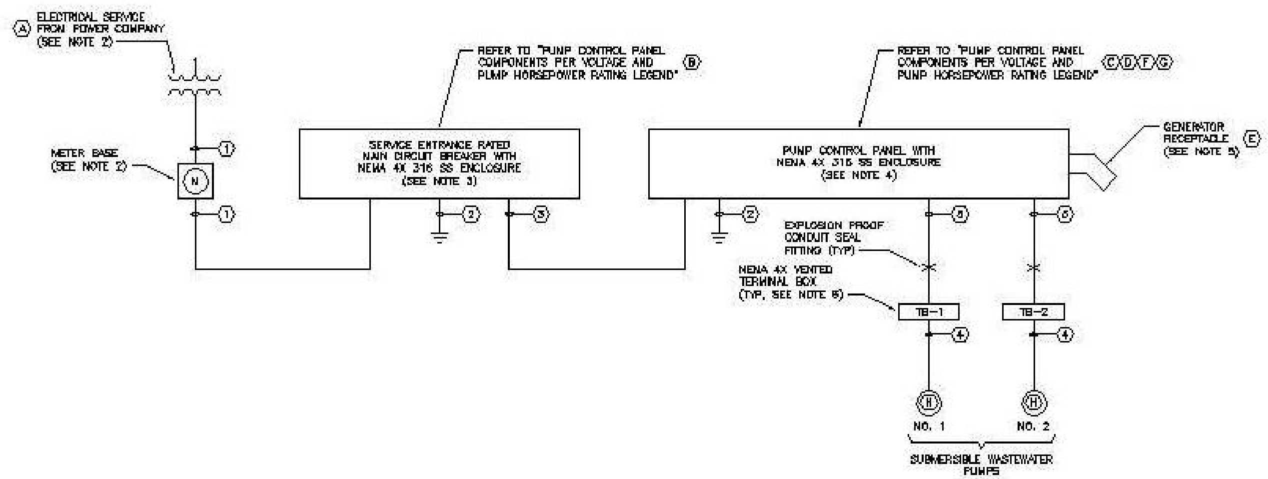


City of Valdosta Lift Station Control Panel Symbols and Abbreviations



Revised March 2007

City of Valdosta Pump Station Single Line Power Diagram



TYPICAL PUMP STATION

SINGLE LINE POWER DIAGRAM

NTS

NOTES:

1. SINGLE LINE POWER DIAGRAM IS TYPICAL FOR A DUPLEX PUMP STATION WITH SOLID STATE REDUCED VOLTAGE STARTERS SERVING RESIDENTIAL WASTEWATER. HAZARDOUS AREA CLASSIFICATION OF WET WELL IS ASSUMED TO BE CLASS I, DIVISION 2, PER NFPA 820, ROW 11(a).
2. DEPENDING ON DESIGN, ELECTRICAL SERVICE FROM THE POWER COMPANY COULD BE A NEW INSTALLATION OR AN EXISTING POINT OF SERVICE. COORDINATE WITH POWER COMPANY FOR CONDUIT, WIRING, GROUNDING AND INSTALLATION REQUIREMENTS OF METER, METER BASE, CT'S, ETC.
3. SERVICE ENTRANCE RATED MAIN CIRCUIT BREAKER SHALL BE UL LISTED AND CONTAIN A TYPE 1, UL 1449, 3RD EDITION LISTED SPD. CIRCUIT BREAKER FOR SPD SHALL BE SIZED PER MANUFACTURER.
4. PUMP CONTROL PANEL CONTAINS THE FOLLOWING COMPONENTS: MAIN AND GENERATOR CIRCUIT BREAKERS (MECHANICALLY INTERLOCKED), GROUND BUS, TYPE 2, UL 1449, 3RD EDITION LISTED SPD WITH CIRCUIT BREAKER SIZED PER MANUFACTURER, PHASE MONITOR, MOTOR CIRCUIT PROTECTORS, SOLID STATE REDUCED VOLTAGE STARTERS (SSRV) AND PLC. REFER TO CONTROL DIAGRAMS FOR ADDITIONAL COMPONENTS AND CONTROLS.
5. PROVIDE A GENERATOR RECEPTACLE WITH ANGLE ADAPTER AND MOUNTING BOX. RECEPTACLE SHALL BE BY RUSSELSTOLL OR APPROVED EQUAL. COORDINATE AND VERIFY EXACT PIN ARRANGEMENT, GROUNDING STYLE, MOUNTING BOX STYLE, ETC., WITH THE OWNER.
6. TERMINAL BOXES ARE RATED CLASS I, DIVISION 2 HAZARDOUS AREA CLASSIFICATION. SHOULD THE AREA BE CLASSIFIED CLASS I, DIVISION 1, TERMINAL BOXES SHALL BE BE NEMA 7, EXPLOSION-PROOF RATED AND NOT VENTED.

PUMP CONTROL PANEL COMPONENTS PER VOLTAGE AND HORSEPOWER RATING LEGEND

LETTER	ITEM DESCRIPTION	120/240, 1ø, 3W (UP TO 5HP)	120/240, 3ø, 4W OPEN DELTA (UP TO 6.5HP)	120/240, 3ø, 4W OPEN DELTA (UP TO 15HP)	120/208, 3ø, 4W (UP TO 5HP)	120/208, 3ø, 4W (UP TO 15HP)	120/208, 3ø, 4W (UP TO 25HP)	120/208, 3ø, 4W (UP TO 50HP)	480V, 3ø, 3W (UP TO 5HP)	480V, 3ø, 3W (UP TO 15HP)	480V, 3ø, 3W (UP TO 25HP)	480V, 3ø, 3W (UP TO 50HP)
A	AVAILABLE SERVICE	120/240V, 1ø, 3W	120/240V, 3ø, 4W, OPEN DELTA	120/240V, 3ø, 4W, OPEN DELTA	120/208V, 3ø, 4W	120/208V, 3ø, 4W	120/208V, 3ø, 4W	120/208V, 3ø, 4W	480V, 3ø, 3W	480V, 3ø, 3W	480V, 3ø, 3W	480V, 3ø, 3W
B	SERVICE ENTRANCE MAIN CIRCUIT BREAKER RATING	100A,2P	100A,3P	200A,3P	100A,3P	200A,3P	250A,3P	400A,3P	100A,3P	100A,3P	150A,3P	200A,3P
C	CONTROL PANEL MAIN CIRCUIT BREAKER RATING	100A,2P	100A,3P	200A,3P	100A,3P	200A,3P	250A,3P	400A,3P	100A,3P	100A,3P	150A,3P	200A,3P
D	GENERATOR CIRCUIT BREAKER RATING	100A,2P	100A,3P	200A,3P	100A,3P	200A,3P	250A,3P	400A,3P	100A,3P	100A,3P	150A,3P	200A,3P
E	GENERATOR RECEPTACLE RATING	100A,3P	100A,4P	200A,4P	100A,4P	200A,4P	250A,4P	400A,4P	100A,4P	100A,4P	150A,4P	200A,4P
F	BUS RATING	100A, 120/240V, 1ø, 3W	100A, 120/240V, 3ø, 4W	225A, 120/240V, 3ø, 4W	100A, 120/208V, 3ø, 4W	225A, 120/208V, 3ø, 4W	400A, 120/208V, 3ø, 4W	400A, 120/208V, 3ø, 4W	100A, 480V, 3ø, 3W	100A, 480V, 3ø, 3W	225A, 480V, 3ø, 3W	225A, 480V, 3ø, 3W
G	MOTOR CIRCUIT PROTECTOR RATINGS	70A,2P	30A,3P	80A,3P	80A,3P	90A,3P	110A,3P	125A,3P	30A,3P	70A,3P	100A,3P	150A,3P
H	MAXIMUM SUBMERSIBLE PUMP RATING	5HP	6.5HP	15HP	5HP	15HP	25HP	50HP	5HP	15HP	25HP	50HP

SEE SHEET E-3 FOR EXAMPLE

SEE SHEET E-4 FOR EXAMPLE

SEE SHEET E-6 FOR EXAMPLE

CONDUIT AND WIRE PER VOLTAGE AND HORSEPOWER RATING LEGEND

NUMBER	120/240, 1ø, 3W (UP TO 5HP)	120/240, 3ø, 4W OPEN DELTA (UP TO 6.5HP)	120/240, 3ø, 4W OPEN DELTA (UP TO 15HP)	120/208, 3ø, 4W (UP TO 5HP)	120/208, 3ø, 4W (UP TO 15HP)	120/208, 3ø, 4W (UP TO 25HP)	120/208, 3ø, 4W (UP TO 50HP)	480V, 3ø, 3W (UP TO 5HP)	480V, 3ø, 3W (UP TO 15HP)	480V, 3ø, 3W (UP TO 25HP)	480V, 3ø, 3W (UP TO 50HP)
1	2"C., 2#2, 1#2N	2"C., 3#2, 1#2N	3"C., 3#3/0, 1#3/0N	2"C., 3#2, 1#2N	3"C., 3#3/0, 1#3/0N	3"C., 3#4/0, 1#4/0N	(2) 3"C., 3#3/0, 1#3/0N	2"C., 3#2, 1#2N	2"C., 3#2, 1#2N	2 1/2"C., 3#1/0, 1#1/0N	3"C., 3#3/0, 1#3/0N
2	#2/0 GND TO 3/4" CWP (IF AVAILABLE), 3/4" DIA X 10' COPPERWELD GROUND RODS AND GROUND LOOP	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS	SAME FOR ALL PUMP STATIONS
3	2"C., 2#2, 1#2N, 1#6G	2"C., 3#2, 1#2N, 1#6G	3"C., 3#3/0, 1#3/0N, 1#4G	2"C., 3#2, 1#2N, 1#6G	3"C., 3#3/0, 1#3/0N, 1#4G	3"C., 3#4/0, 1#4/0N, 1#4G	(2) 3"C., 3#3/0, 1#3/0N, 1#2G	2"C., 3#2, 1#6G	2"C., 3#2, 1#6G	2 1/2"C., 3#1/0, 1#6G	3"C., 3#3/0, 1#4G
4	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR	CONDUIT SIZED PER PUMP MFR CABLE REQUIREMENTS WITH CABLES BY PUMP MFR
5	1"C., 2#4, 1#8G	1"C., 3#6, 1#10G	2"C., 3#2, 1#6G	1 1/2"C., 3#4, 1#8G	2"C., 3#2, 1#6G	2 1/2"C., 3#1/0, 1#6G	(2) 3"C., 3#3/0, 1#2G	3/4"C., 2#10, 1#10G	1 1/2"C., 3#4, 1#8G	2"C., 3#2, 1#6G	2 1/2"C., 3#1/0, 1#6G

SEE SHEET E-3 FOR EXAMPLE

SEE SHEET E-4 FOR EXAMPLE

SEE SHEET E-6 FOR EXAMPLE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: NOVEMBER 2011

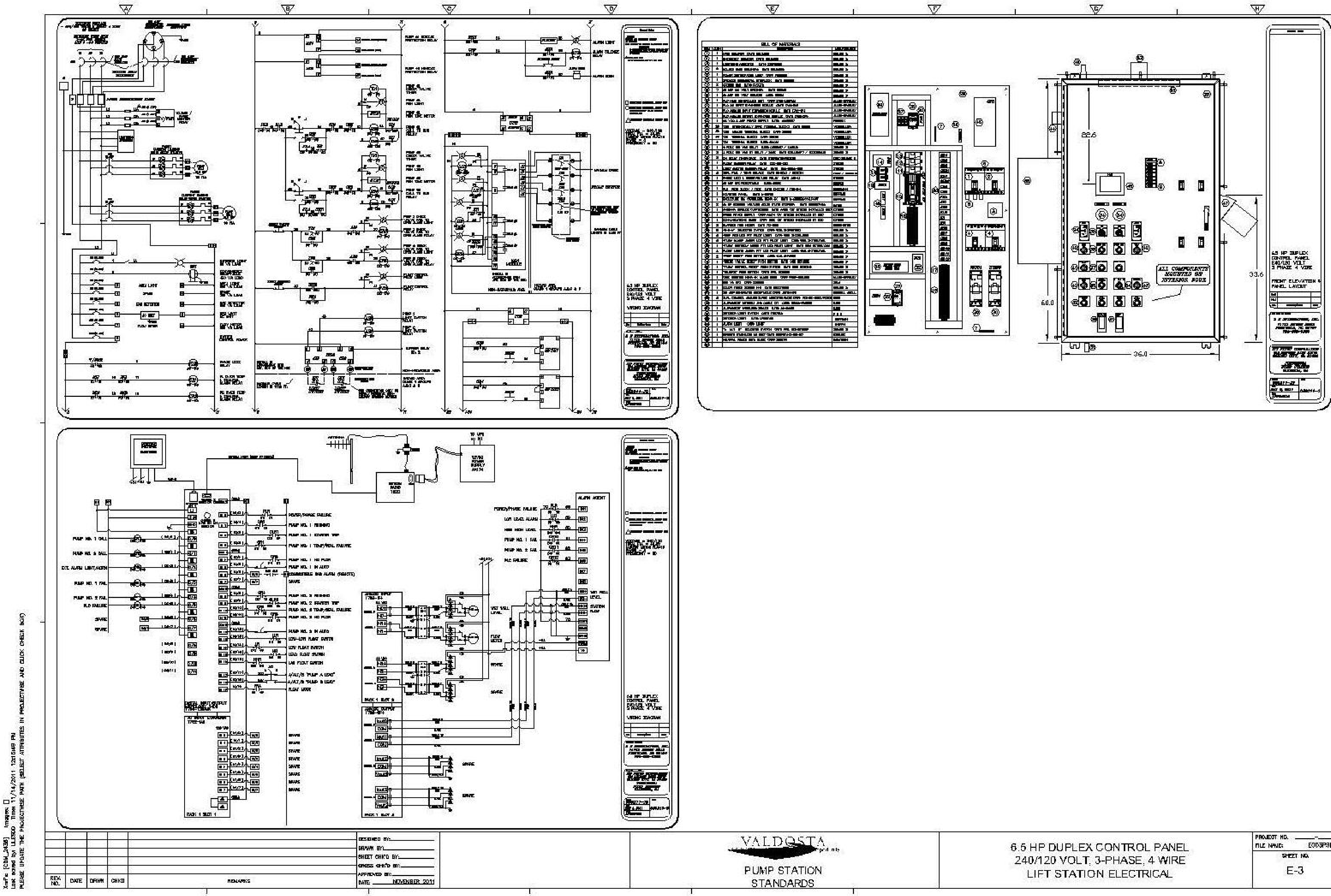
VALDOSTA

PUMP STATION STANDARDS

TYPICAL PUMP STATION
SINGLE LINE POWER DIAGRAM
AND LOAD SCHEDULES

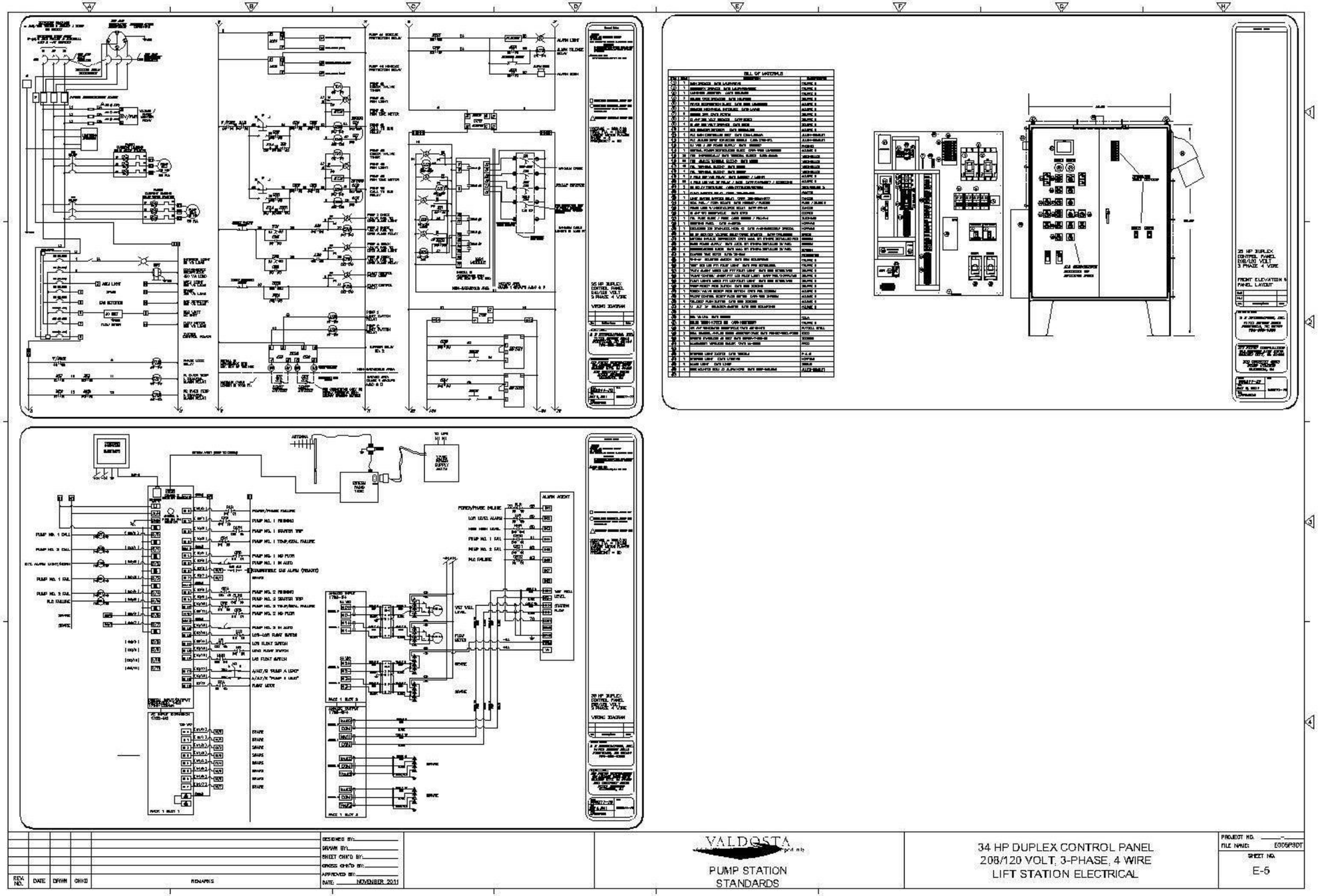
PROJECT NO. -
FILE NAME: EX02GESL
SHEET NO.
E-2

City of Valdosta Control Panel (240/120 Volt, 3-Phase, 4-wire)



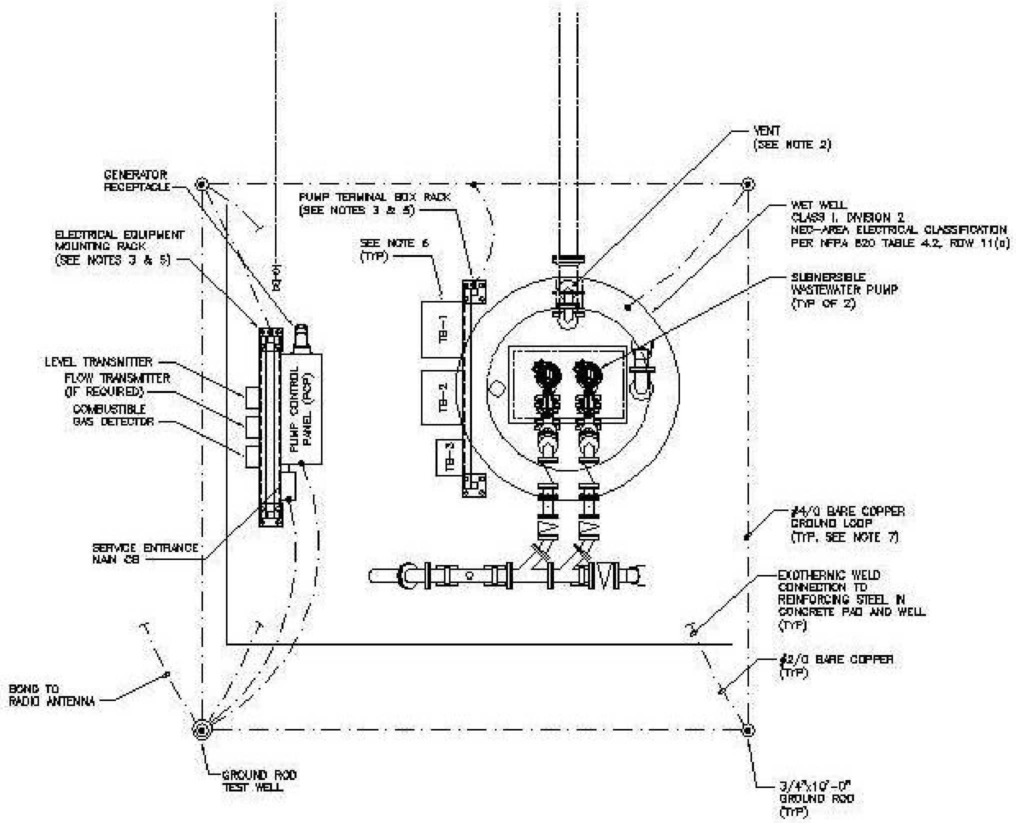
Revised March 2007

City of Valdosta Control Panel (208/120 Volt, 3-Phase, 4-wire)



Revised March 2008

City of Valdosta Typical Pump Station Plan



TYPICAL PUMP STATION
PLAN
NTS

NOTES:

1. PUMP STATION PLAN IS TYPICAL FOR A DUPLEX PUMP STATION WITH SOLID STATE REDUCED VOLTAGE STARTERS, SERVING RESIDENTIAL WASTEWATER. PIPING, WELL, PUMP ORIENTATION AND SIZE ARE SUBJECT TO CHANGE BASED ON THE SITE AND DESIGN.

2. ALL AREAS WITHIN 3'—0" RADIUS OF VENT CLASS I, DIVISION 2 NEC—AREA ELECTRICAL CLASSIFICATIONPER NFPA 820.

3. ELECTRICAL EQUIPMENT ORIENTATION AND LOCATION VARIES BASED ON PUMP STATION. [REFER TO ELECTRICAL SITE PLANS FOR LOCATION AND ORIENTATION.] CONTRACTOR SHALL MAINTAIN NEC WORKING CLEARANCE IN FRONT OF INSTRUMENTS. SERVICE ENTRANCE MAIN CB, PUMP CONTROL PANEL AND PUMP TERMINAL BOXES REGARDLESS OF ORIENTATION.

4. COORDINATE WITH POWER COMPANY FOR LOCATION AND INSTALLATION REQUIREMENTS OF METER, METER BASE, CT'S, ETC.

5. ELECTRICAL EQUIPMENT RACK SHALL BE LOCATED A MINIMUM OF 5'—0" FROM THE WET WELL AND A MINIMUM OF 3'—0" FROM THE PUMP TERMINAL BOX RACK.

6. PROVIDE A 316 SS NEMA 4X RATED VENTED TERMINAL BOX WITH 600V INSULATED TERMINAL BLOCKS, SIZED PER NEC. THE BOTTOM OF THE PUMP TERMINAL BOXES SHALL BE MOUNTED 36" ABOVE FINISHED SLAB.

7. MINIMUM ALLOWED DISTANCE BETWEEN GROUND RODS IS 20'—0". MAXIMUM ALLOWED DISTANCE IS 50'—0".

8. PUMP CONTROL PANEL, TRANSMITTERS AND SERVICE ENTRANCE MAIN CIRCUIT BREAKER TO BE MOUNTED ABOVE THE 100 YEAR FLOOD ELEVATION.

9. TYPICAL PUMP STATION SITE SIZE IS 50' x 50'.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: NOVEMBER 2011

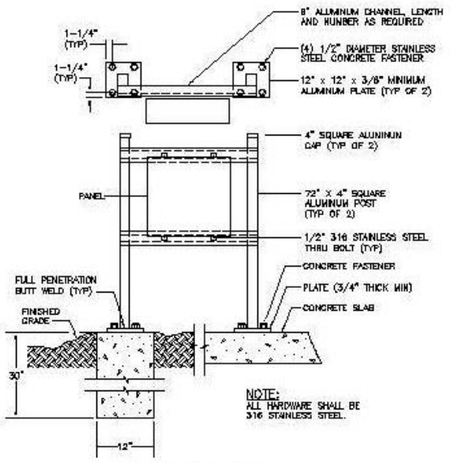
VALDOSTA

PUMP STATION
STANDARDS

TYPICAL PUMP STATION PLAN

PROJECT NO. -
FILE NAME: E06BPSPL
SHEET NO.
E-6

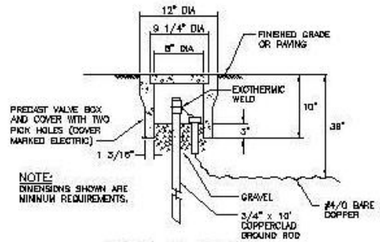
City of Valdosta Typical Pump Station Electrical Details



EQUIPMENT MOUNTING

DETAIL

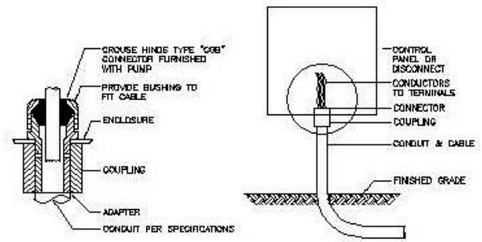
NTS



GROUND ROD TEST WELL

DETAIL

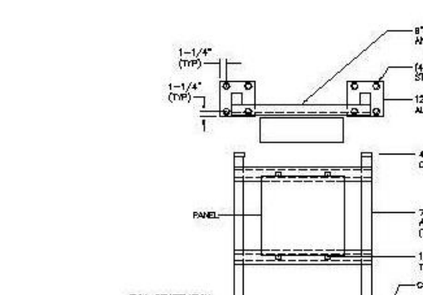
NTS



WATER-TIGHT CONNECTION

DETAIL

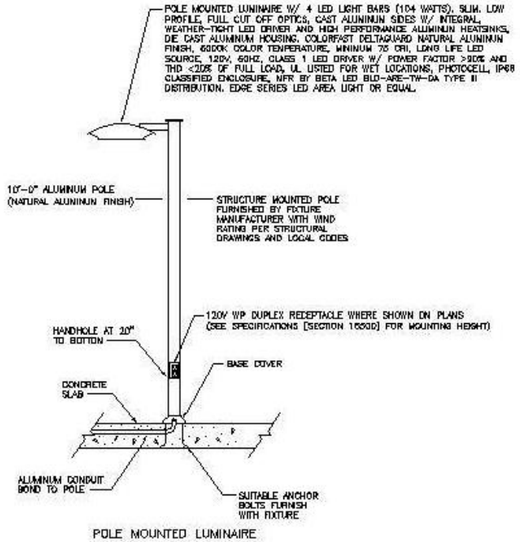
NTS



TYPICAL DIRECT BURIED CONDUIT INSTALLATION

DETAIL

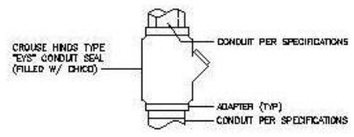
NTS



POLE MOUNTED LUMINAIRE

DETAIL

NTS

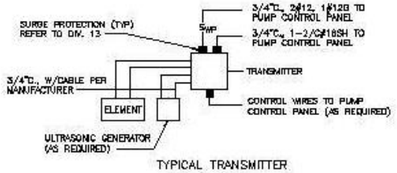


NOTE:
DO NOT FILL SPARES OR STUBBED-OUT CONDUIT WITH CHICO. LEAVE EMPTY.

CONDUIT SEAL CONNECTION

DETAIL

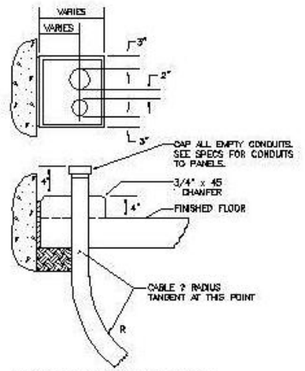
NTS



TYPICAL TRANSMITTER

DETAIL

NTS



TYPICAL CONDUIT THROUGH SLAB

DETAIL

NTS

XrefS: [CON_SA36] images: [] Last saved by LLESKO Time: 11/14/2011 3:33:21 PM
PLEASE UPDATE THE PROJECTWISE PATH (SELECT ATTRIBUTES IN PROJECTWISE AND CLICK CHECK BOX)

REV. NO.	DATE	DRWN	CHKD	REMARKS

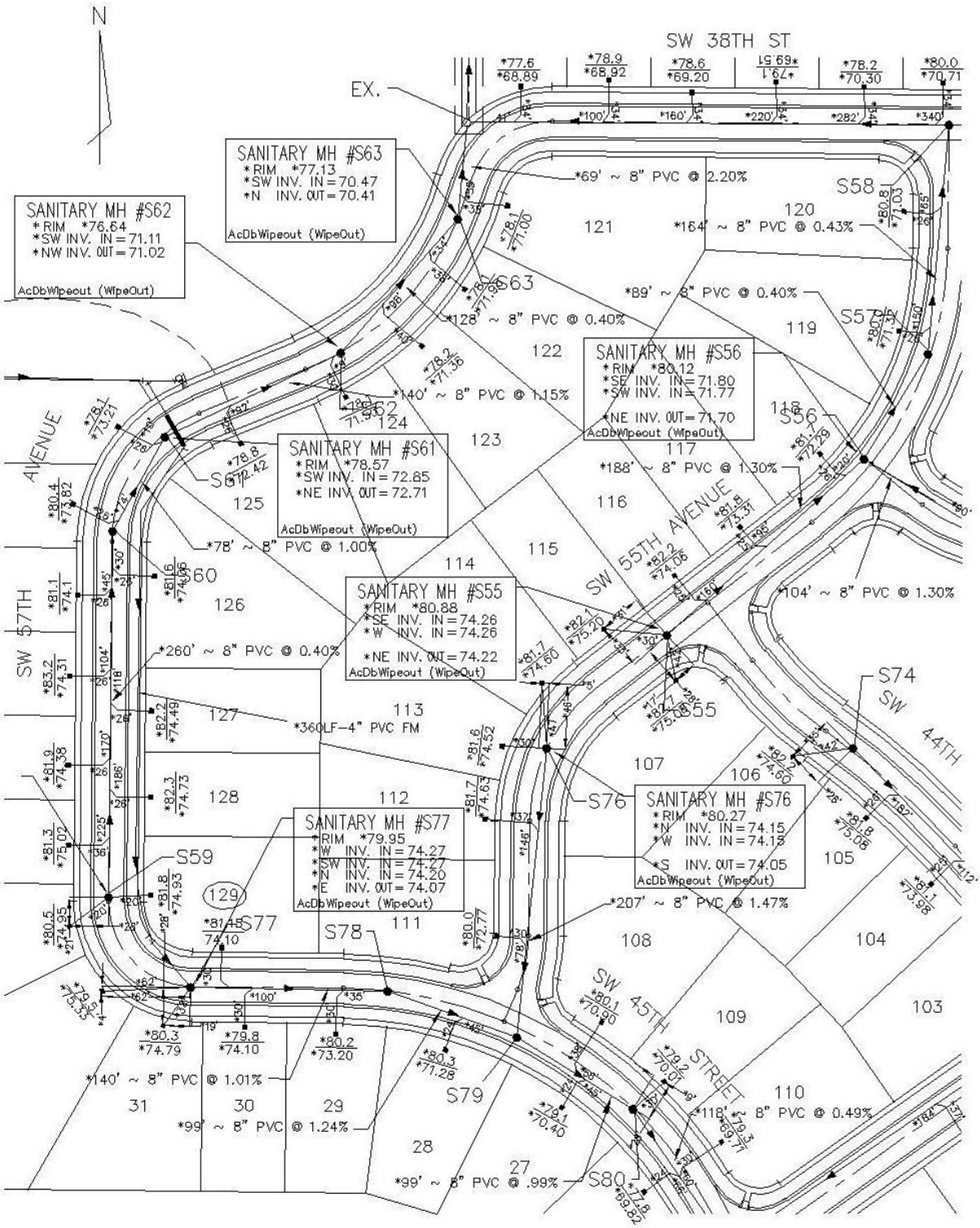
DESIGNED BY:
DRAWN BY:
SHEET CHKD BY:
CROSS CHKD BY:
APPROVED BY:
DATE: NOVEMBER 2011

VALDOSTA

PUMP STATION STANDARDS

ELECTRICAL DETAILS

PROJECT NO. —
FILE NAME: ED1DETL
SHEET NO.
ED-1



SPECIFICATION		DATE REVISED:	SECTION
			SHT 1 OF 1

CITY OF VALDOSTA	CITY OF VALDOSTA STANDARD DETAIL	TYPICAL SANITARY SEWER ASBUILT DRAWING	A
			498-9.1

DIVISION 490

SECTION 499

SANITARY SEWER SYSTEM

STANDARD MATERIALS SPECIFICATIONS

SECTION 499

SANITARY SEWER SYSTEM STANDARD MATERIALS

Following is a list of standard materials to be used in the installation of the sanitary sewer system. Shop drawings are to be submitted in accordance with City of Valdosta, Volume I, General Conditions for Construction. Materials requiring the traditional "Shop Drawing Submittal" are identified by the words "Shop Drawing Required" at the bottom of the specification sheet. All materials must be submitted on form WSCM001. A copy of form WSCM001 is provided in the Appendix section of this manual.

LIST OF SANITARY SEWER STANDARD MATERIALS

499-01 ADAPTOR COUPLINGS

499-01-11-01	Coupling, Rubber Adaptor, Clay to DIP
499-01-12-01	Coupling, Rubber Adaptor, Clay to SCH 40 PVC
499-01-13-01	Coupling, Rubber Adaptor, Clay to 3034 PVC
499-01-99-01	Boot, Rubber

499-02 MANHOLES

499-02-03-01	Brick, Common
499-02-09-01	Ring and Cover
499-02-09-02	Ring and Cover, Manhole, C. I.
499-02-09-03	Hinged Ring & Cover
499-02-10-01	Precast Concrete Slab
499-02-11-01	Precast Adjusting Ring
499-02-99-01	Precast Concrete Manhole (Mildly Corrosive Environs)
499-02-99-02	Precast Concrete Wetwell (Mildly Corrosive Environs)
499-02-99-03	Precast Concrete Pump Pit
499-02-99-05	Precast Concrete Box
499-02-99-06	Precast Manhole w/HDPE liner (Corrosive Environs)
499-02-99-07	Precast Wetwell w/HDPE liner (Corrosive Environs)
499-02-99-20	Fiberglass Wetwell (Highly Corrosive Environs)
499-02-99-21	Fiberglass Manhole (Highly Corrosive Environs)
499-02-99-22	Fiberglass Pump Pit

499-03 RESERVED

499-04 RESERVED

499-05 FITTINGS

499-05-02-01	Bend, 22½° PVC
499-05-02-02	Bend, 45° PVC
499-05-25-06	Plug PVC

499-05-29-01	Stop, Poly
499-05-99-01	Bend, 11 ¼ ° Ductile Iron, Mechanical Joint
499-05-99-02	Bend, 22 ½ ° Ductile Iron, Mechanical Joint
499-05-99-03	Bend, 45° Ductile Iron, Mechanical Joint
499-05-99-04	Bend, 90° Ductile Iron, Mechanical Joint
499-05-99-07	Bend, 45° Ductile Iron, Mechanical Joint X Plain End
499-05-99-08	Bend, 45° Ductile Iron, Flanged
499-05-99-09	Bend, 90° Ductile Iron, Flanged
499-05-99-10	Wye, Single PVC
499-05-99-11	Wye, Double PVC
499-05-99-15	Wye, Single, Ductile Iron, Mechanical Joint
499-05-99-16	Wye, Single, Ductile Iron, Flanged
499-05-99-21	Reducer, PVC
499-05-99-22	Reducer, Bell Mouth
499-05-99-23	Reducer, Ductile Iron, Flanged
499-05-99-25	Adaptor, Ductile Iron, Flange X Plain End
499-05-99-31	Cleanout Hub, PVC Threaded X Slip
499-05-99-32	Cleanout Plug, Brass
499-05-99-33	Cleanout Plug, PVC Threaded
499-05-99-34	Cleanout Tee, PVC
499-05-99-35	Vent Hood
499-05-99-35A	Vent Stock, PVC
499-05-99-36	Tee, PVC, Gasketed
499-05-99-40	Flange Adaptor
499-05-99-42	Blind Flange
499-05-99-51	Retaining Device, Mechanical Joint
499-05-99-60	Cam-lock Assembly
499-05-99-65	Restrained Fitting, Mega-Lug, DIP
499-05-99-70	Saddle, Tapping, Stainless Steel

499-06 RESERVED

499-07 PIPE

499-07-06-02	Pipe, PVC, 3034 DR 26
499-07-15-01	Pipe, Ductile Iron, Pushon, Epoxy Lined
499-07-15-02	Restrained Joint Pipe, Ductile Iron
499-07-20-01	Pipe, HDPE, Fusion
499-07-99-01	Pipe, PVC, Sch 80, Solvent Weld
499-07-99-04	Pipe, PVC, Fusion
499-07-99-05	Pipe, PVC, C-900, DR 18
499-07-99-06	Restrained Joint Pipe, PVC
499-07-99-15	Pipe, Ductile Iron, Flanged, Epoxy Lined

499-08 RESERVED

499-09 RESERVED

499-10 VALVES

499-10-07-02	Valve, Eccentric Plug
499-10-99-01	Valve, Air Release
499-10-99-02	PVC Valve, Air Release
499-10-99-10	Valve, Check, Spring & Lever, Flanged, Epoxy Lined
499-10-99-11	Valve, Check, Swing-Flex, Flanged, Epoxy Lined

499-11 MISCELLANEOUS

499-11-03-01	Marker, Sanitary Sewer
499-11-31-05	Liner, Cement, Calcium Aluminate
499-11-99-01	Link Seal
499-11-99-02	Coating, Bituminous
499-11-99-03	Lining, Amine Cured Epoxy
499-11-99-04	Coating, Exposed Metal and Piping
499-11-99-05	Coating, Submerged Metal and Piping (Highly Corrosive)
499-11-99-06	Coating, Concrete Wetwells and Manholes (Mildly Corrosive)
499-11-99-08	Coating, Concrete Wetwells and Manholes (Highly Corrosive)
499-11-99-21	Backflow Preventer, R.P.
499-11-99-30	Precast Concrete Post
499-11-99-31	Ladder, Fiberglass
499-11-99-40	Dehumidifier
499-11-99-41	Fan, In-Line Duct
499-11-99-42	Fluorescent Light

499-12 PUMPING EQUIPMENT

499-12-99-01	Pump Station, with Enclosure
499-12-99-02	Pump Station, without Enclosure
499-12-99-03	Pump Station, Submersible
499-12-99-10	Sump Pump, 1/4 - 1/3hp
499-12-99-11	Sump Pump, Submersible 1/2hp
499-12-99-20	Float, Ball Type
499-12-99-21	Lift Station Main Disconnect
499-12-99-31	Lift Station Main Electrical Panel

499-13 SCADA

499-13-99-01	Remote Terminal Unit Assembly

MATERIAL SPECIFICATION: 499-01-11-01

NOMENCLATURE:

COUPLING, RUBBER ADAPTOR

DESCRIPTION:

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER		
SIZE	FERNCO	INDIANA SEAL	DALLAS SPECIALTY
4”	1003-44	103-44	DS 03-44
6”	1003-66	106-66	DS 03-66
8”	1003-88	103-88	DS 03-88
10”	1003-1010	103-1010	DS 03-1010

MATERIAL SPECIFICATION: 499-01-12-01

NOMENCLATURE:

ADAPTOR COUPLING, RUBBER

DESCRIPTION:

To connect clay pipe to Schedule 40 PVC pipe.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER		
SIZE	FERNCO	INDIANA SEAL	DALLAS SPECIALTY
4”	1002-44	102-44	DS 02-44
6”	1002-64	102-64	DS 02-64
8”	1002-88	102-88	DS 02-88
10”	1002-1010	102-1010	DS 02-1010
12”	1002-1212	102-1212	DS 02-1212
15”	1002-1515	102-1515	DS 02-1515
18”	1002-1818	102-1818	DS 02-1818

MATERIAL SPECIFICATION: 499-01-13-01

NOMENCLATURE:

COUPLING, RUBBER ADAPTOR

DESCRIPTION:

To connect clay pipe to #3033 PVC pipe.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	CALDER
6”	6” CP TO 6” #3033 PVC

MATERIAL SPECIFICATION: 499-01-99-01

NOMENCLATURE:

BOOT, RUBBER

DESCRIPTION:

Shall be flexible rubber connector boot conforming to ASTM C-923-latest with stainless steel bands.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
6”	
8”	
10”	
12”	
15”	
18”	

MATERIAL SPECIFICATION: 499-02-03-01

NOMENCLATURE:

BRICK, COMMON CONCRETE

DESCRIPTION:

To fill in holes, adjust manhole ring and covers.
To construct sewer manholes.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
4” x 8” PRECAST CONCRETE BLOCKS	

MATERIAL SPECIFICATION: 499-02-09-01

NOMENCLATURE:

RING AND COVER

DESCRIPTION:

Tough, close-grained gray iron, sound, smooth, clean, free from blisters and defects. Used on sanitary sewer manholes. Shall meet H-20 loading requirement defined in AASHTO, Federal Specification RR-F-621-C, shall be marked as detailed on Detail 498-1.2A. ASTM A-48 Class 30B. All components shall be black coated.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
SIZE	U. S. FOUNDRY	VULCAN FOUNDRY
24”		
32”	USF 655CW-M	

MATERIAL SPECIFICATION: 499-02-09-02

NOMENCLATURE:

RING AND DOUBLE COVER, MANHOLE, C. I.

DESCRIPTION:

Tough, close-grained, gray iron, sound, smooth, clean, free from blisters and defects. Used on sanitary sewer manholes. Shall meet H-20 loading requirement defined in AASHTO, Federal Specification RR-F-621-E. Cover to incorporate a second smaller cover. Shall be marked as detailed on Standard Detail 498-1.2A. ASTM A-48 Class 30B. All components shall be black coated.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	U. S. FOUNDRY
RING 4" H x 32" CLR OPENING	#655
LARGE COVER - 34 1/8" x 1 1/2"	#CW
SMALL COVER – 22 1/4" x 1 1/2"	#M

MATERIAL SPECIFICATION: 499-02-10-01

NOMENCLATURE:

PRECAST CONCRETE SLAB

DESCRIPTION:

Pre-cast concrete slab, shall have access offset from center, slab to be eight inches (8") thick, five feet four inches (5'- 4") diameter and shall have bituminous coating inside and out, shall meet H-20 loading requirements per GDOT. Refer to Section 498-1 for size of access cover.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
5’ 4” DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

***** S H O P D R A W I N G R E Q U I R E D *****

MATERIAL SPECIFICATION: 499-02-11-01

NOMENCLATURE:

PRECAST ADJUSTING RING

DESCRIPTION:

Shall have 24" or 32" access entrance, to be constructed with 4,000 psi concrete, using one ¼" round steel ring, ¼" in diameter for reinforcing.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
24" x 2"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
24" x 4"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
24" x 6"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
32" x 2"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
32" x 4"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
32" x 6"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

MATERIAL SPECIFICATION: 499-02-99-01

NOMENCLATURE:

PRECAST CONCRETE MANHOLE (FOR MILDLY CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Manholes shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10 (a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, specification for Portland Cement, Type II. Concrete for manholes shall meet the minimum requirements for Class III. Minimum wall thickness shall be as specified in Section 498-1. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14. Contractor shall be responsible for all testing. Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.

Joint contact surfaces shall be formed exactly parallel with a 2° slope and nominal $^{1}/_{16}$" clearance with the tongue equipped with a proper recess for the installation of an o-ring rubber gasket.

Coatings shall cover the interior and exterior surfaces of the manhole except the joint contact surfaces and the annular openings for pipe connections. Interior coating shall be epoxy coating as specified in 499-11-99-06 or 499-11-99-07 as indicated in the Contract Documents. Exterior coating shall be bituminous coating as specified in 499-11-99-02. Coating shall be applied at the place of fabrication.

Manhole connectors shall be installed using a flexible rubber gasket. No adhesives or lubricants shall be employed in the installation of the connector into the manhole. The connector shall be installed in the manhole wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
48” DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
60” DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-02-99-02

NOMENCLATURE:

PRECAST CONCRETE WET WELL (FOR MILDLY CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Wet well shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, Specification for Portland Cement, Type II. Concrete for wet well shall meet the minimum requirements for Class III. Minimum wall thickness shall be eight inches or 1/12 the inside diameter whichever is greater. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing. Wet well shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.

Joint contact surfaces shall be formed exactly parallel with a two degree (2°) slope and nominal $^{1}/_{16}$" clearance with the tongue equipped with a proper recess for the installation of an o-ring rubber gasket.

Coatings shall cover the interior and exterior surfaces of the wet well. Interior coating shall be epoxy coatings as specified in 499-11-99-06 or 499-11-99-07 as indicated in the contract documents. Exterior coating shall be of a bituminous coating as specified in 499-11-99-02. Coatings shall be applied at the place of fabrication. Joint surfaces and holes provided for handling capabilities shall be sealed after installation by the Contractor.

Wet well connectors shall be installed using a flexible rubber gasket. No adhesives or lubricants shall be employed in the installation of the connector into the wet well. The connector shall be installed in the wet well wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
6’ DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
8’ DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
10’ DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
12’ DIAMETER	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

- **** S H O P D R A W I N G R E Q U I R E D *****

MATERIAL SPECIFICATION: 499-02-99-03

NOMENCLATURE:

PRECAST CONCRETE PUMP PIT

DESCRIPTION:

Pump Pit shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10 (a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, Specification for Portland Cement, Type II. Concrete for pump pit shall meet the minimum requirements for Class III. Minimum wall thickness shall be eight inches or $^{1}/_{12}$ the inside diameter whichever is greater. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing. Pump pit shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.

Joint contact surfaces shall be formed exactly parallel with a 2° slope and nominal $^{1}/_{16}$" clearance with the tongue equipped with a proper recess for the installation of an o-ring rubber gasket.

Exterior surface of the Pump Pit shall be coated with a bituminous coating as specified in 499-11-99-02 and shall be applied at the place of fabrication. Joint surfaces and holes provided for handling capabilities shall be sealed after installation by the Contractor.

Openings for piping shall be installed at time of fabrication and shall be to the size and locations shown on the Plans.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
8’ DIAMETER	
10’ DIAMETER	
12’ DIAMETER	
8’ x 8’	
10’ x 10’	
12’ x 12’	

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-02-99-05

NOMENCLATURE:

BOX, UTILITY, PRECAST CONCRETE

DESCRIPTION:

Pre-cast Concrete Utility Box with lid shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10 (a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, Specification for Portland Cement, Type I/II. Concrete for utility boxes shall be 4,000 PSI and meet the minimum requirements for Class III. Minimum wall thickness shall be six inches. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing. Reinforcing shall be #4 GR60 re-bar 12" O.C. both ways. Utility box shall be constructed with open bottom.

Top slab shall be six inches (6") thick, 4,000 PSI with #4 GR60 re-bar 9" O.C. both ways and furnished with aluminum hatch as specified on Detail 498-4.1A(4).

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
48” x 66” x 24” BOX	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)
48” x 66” x 6” TOP	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-02-99-06

NOMENCLATURE:

PRECAST CONCRETE MANHOLE WITH HDPE LINING (FOR CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Manholes shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, specification for Portland Cement, Type II. Concrete for manholes shall meet the minimum requirements for Class III. Minimum wall thickness shall be as specified in Section 498-1. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing. Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.

Joint contact surfaces shall be formed exactly parallel with a 2° slope and nominal $^{1}/_{16}$" clearance with the tongue equipped with a proper recess for the installation of an o-ring rubber gasket.

Coatings shall cover the interior and exterior surfaces of the manhole. Coating shall be applied at the place of fabrication. Interior of wet well shall have a non-corrosive high-density polyethylene liner (HDPE) as specified in 499-02-99-07. External coating shall be of a bituminous coating as specified in 499-11-99-02.

Manhole connectors shall be installed using a flexible rubber gasket. No adhesives or lubricants shall be employed in the installation of the connector into the manhole. The connector shall be installed in the manhole wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations. Manufacturer must certify that manhole and liner have been properly installed.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
48” DIAMETER	HANSON PIPE & PRODUCTS, DEL ZOTTO (OR EQUAL)
60” DIAMETER	HANSON PIPE & PRODUCTS, DEL ZOTTO (OR EQUAL)

***** SHOP DRAWING REQUIRED *****

***** CERTIFICATION REQUIRED *****

MATERIAL SPECIFICATION: 499-02-99-07

NOMENCLATURE:

PRECAST CONCRETE WET WELL WITH HDPE LINING (FOR CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Wet well shall meet the requirements of ASTM C478-latest, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-latest, specification for Portland Cement, Type II. Concrete for wet well shall meet the minimum requirements for Class III. Minimum wall thickness shall be 8" or $^{1}/_{12}$ the inside diameter whichever is greater. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing. Wet well shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.

Joint contact surfaces shall be formed exactly parallel with a 2° slope and nominal $^{1}/_{16}$" clearance with the tongue equipped with a proper recess for the installation of an o-ring rubber gasket.

Coatings shall cover the interior and exterior surfaces of the wet well. Interior of the wet well shall have a non-corrosive high-density polyethylene liner (HDPE). Exterior coating shall be of a bituminous coating as specified in 499-11-99-02. Coatings shall be applied at the place of fabrication. Joint surfaces and holes provided for handing capabilities shall be sealed after installation by the **CONTRACTOR**. Wet well liner shall be embedded into pre-cast concrete with anchoring ribs during manufacturing process. Anchoring ribs shall be placed a minimum of 30 per square foot of liner in one piece with the HDPE sheet, and shall be of the same material. Liner shall be 80 mils. thick minimum, with a resistance to pull out of 125 lbs/ft^2 minimum, and withstand a back pressure of 30 psi. The HDPE material shall have the standard valves consistency of a maximum working temperature of 140°F, fire classification of V2 as defined by UL-94, density of 0.945 g/cc as defined in ASTM D792-86, and puncture resistance of 170 lbs. as defined by ASTM D4833. The liner shall be flexible to elongate to bridge up to a ¼" setting or expansion.

Wet well connectors shall be installed using a flexible rubber gasket. No adhesives or lubricants shall be employed in the installation of the connector into the wet well. The connector shall be installed in the wet well wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations.

<<<<<<<<Continued>>>>>>>>

Installation of the manhole sections and welding of all joints shall be done in accordance with the manufacturer's recommendations for a watertight installation. Manufacturer shall provide certification that wet well and liner have been properly installed to manufacturer's requirements.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
8’ DIAMETER	HANSON PIPE & PRODUCTS, DEL ZOTTO (OR EQUAL)
10’ DIAMETER	HANSON PIPE & PRODUCTS, DEL ZOTTO (OR EQUAL)
12’ DIAMETER	HANSON PIPE & PRODUCTS, DEL ZOTTO (OR EQUAL)

***** SHOP DRAWING REQUIRED *****

***** CERTIFICATION REQUIRED *****

NOMENCLATURE:

FIBERGLASS WET WELL (FOR HIGHLY CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Fiberglass wet well must be placed with a concrete slab and walls for structural reinforcement and support. Fiberglass reinforced polyester wet well shall be manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resigns, with fiberglass reinforcements. Wet well shall be one piece unit with FRP top and bottom. Resin shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial grade "E" type glass in the of form of mat, chopped roving, continuous roving, roving fabric, or a combination of the above having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin. Fillers, when used, shall be inert to the sewer environment and wet well conditions. Additives, such as thixotropic agents, catalyst, promoters, etc. may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirements of this specification. The interior surface of the vessel shall be resin rich with no exposed fibers. The surface shall be free of crazing, delaminations, blisters larger than ½" in diameter, and wrinkles of ⅛" or greater in depth. Surface pits shall be permitted up to six (6) per square foot if they are less than ¾" in diameter and less than $^{1}/_{16}$" in depth. The complete wet well shall have a minimum dynamic-load rating of 16,000 ft/lbs when tested in accordance with ASTM D-3753-latest edition, section 8. To establish this rating, the complete wet well shall not leak, crack, or suffer other damage load tested to 40,000 ft/lbs and shall not deflect vertically downward more than ¼" at the point of load application when loaded to 24,000 pounds. Wet well top shall be closed fiberglass reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as detailed in Section 498-4.1. A neck shall be extended above the top to accommodate concrete slab installation. Bottom shall have a closed reinforced bottom having sufficient stiffening ribs completely enclosed with resin and fiber reinforcement. The bottom shall have a minimum three inch (3") anti-floatation ring or collar. Wet well bottom shall be minimum $^{5}/_{16}$" thickness. All incoming and outgoing pipe connections shall be factory installed or installed per factory recommendations. Installation of PVC pipe must be performed by sanding, priming, and using resin fiber- reinforced band lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the wet well. Boots shall be installed by the wet well manufacturer using FRP pipe stub-out for the boot sealing surface. Manufacturer must certify that wet well has been properly installed to manufacturer's requirements.

<<<Continued>>>

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER L & F MANUFACTURING (OR EQUAL)
6’ DIAMETER	
8’ DIAMETER	
10’ DIAMETER	
12’ DIAMETER	

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-02-99-21

NOMENCLATURE:

FIBERGLASS MANHOLE (FOR HIGHLY CORROSIVE ENVIRONMENTS)

DESCRIPTION:

Fiberglass manhole must be placed with a concrete slab and walls for structural reinforcement and support. Fiberglass reinforced polyester manholes shall be manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resins, with fiberglass reinforcements. Manhole shall be one piece unit with FRP top and bottom. Resin shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial Grade "E" type glass in the form of mat, chopped roving, continuous roving, roving fabric, or a combination of the above having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin. Fillers, when used, shall be inert to the sewer environment and manhole conditions. Additives, such as thixotropic agents, catalyst, promoters, etc. may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirements of this specification. The interior surface of the vessel shall be resin rich with no exposed fibers. The surface shall be free of crazing, delaminations, blisters larger than ½" in diameter, and wrinkles of ⅛" or greater in depth. Surface pits shall be permitted up to six (6) per square foot if they are less than ¾" in diameter and less than $^{1}/_{16}$" in depth. The complete manhole shall have a minimum dynamic-load rating of 16,000 ft/lbs when tested in accordance with ASTM D-3753-latest edition, Section 8. To establish this rating, the complete manhole shall not leak, crack, or suffer other damage load tested to 40,000 ft/lbs and shall not deflect vertically downward more than ¼" at the point of load application when loaded to 24,000 lbs. Manhole top shall be closed fiberglass reinforced with a circular cutout to accommodate the manhole ring and cover assembly. A neck shall be extended above the top to accommodate ring and cover installation and adjustment requirements. Bottom shall be closed and reinforced, having sufficient stiffening ribs completely enclosed with resin and fiber reinforcement. The bottom shall have a minimum three-inch (3") anti-flotation ring or collar. Manhole bottom shall be minimum $^{5}/_{16}$" thickness. All incoming and outgoing pipe connections shall be factory installed or installed per factory recommendations. Installation of PVC pipe must be performed by sanding, priming, and using resin fiber-reinforced band lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the manhole. Boots shall be installed by the manhole manufacturer using FRP pipe stub out for the boot sealing surface.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	L & F MANUFACTURING (OR EQUAL)
48" DIAMETER	
60" DIAMETER	

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-02-99-22

NOMENCLATURE:

FIBERGLASS PUMP PIT

DESCRIPTION:

Fiberglass pump pit must be placed with a concrete slab and walls for structural reinforcement and support. Fiberglass reinforced polyester pump pit shall be manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resigns, with fiberglass reinforcements. Pump pit shall be one piece unit with FRP top and bottom. Resin shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial grade "E" type glass in the of form of mat, chopped roving, continuous roving, roving fabric, or a combination of the above having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin. Fillers, when used, shall be inert to the sewer environment and pump pit conditions. Additives, such as thixotropic agents, catalyst, promoters, etc. may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirements of this specification. The interior surface of the vessel shall be resin rich with no exposed fibers. The surface shall be free of crazing, delaminations, blisters larger than ½" in diameter, and wrinkles of ⅛" or greater in depth. Surface pits shall be permitted up to six (6) per square foot if they are less than ¾" in diameter and less than $^{1}/_{16}$" in depth. The complete pump pit shall have a minimum dynamic-load rating of 16,000 ft/lbs when tested in accordance with ASTM D-3753-latest edition, Section 8. To establish this rating, the complete pump pit shall not leak, crack, or suffer other damage load tested to 40,000 ft/lbs and shall not deflect vertically downward more than ¼" at the point of load application when loaded to 24,000 pounds. Pump pit top shall be closed fiberglass reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as detailed in Section 498-4.1. A neck shall be extended above the top to accommodate concrete slab installation. Bottom shall be closed and reinforced, having sufficient stiffening ribs completely enclosed with resin and fiber reinforcement. The bottom shall have a minimum three inch (3") anti-floatation ring or collar. Pump pit bottom shall be minimum $^{5}/_{16}$" thickness. All incoming and outgoing pipe connections shall be factory installed or installed per factory recommendations. Installation of PVC pipe must be performed by sanding, priming, and using resin fiber-reinforced band lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the pump pit. Boots shall be installed by the pump pit manufacturer using FRP pipe stub-out for the boot sealing surface.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER L & F MANUFACTURING (OR EQUAL)
8’ DIAMETER	
10’ DIAMETER	
12’ DIAMETER	

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-02-01

NOMENCLATURE:

BEND, 22 1/2° PVC

DESCRIPTION:

PVC fitting. Shall conform to ASTM F1336 SDR-26. For gravity piping only.

SIZE	BEND
4”	22 1/2º
6”	22 1/2º

MATERIAL SPECIFICATION: 499-05-02-02

NOMENCLATURE:

BEND, 45° PVC

DESCRIPTION:

PVC fitting. Shall conform to ASTM F1336-80 SDR-26. For gravity piping only.

SIZE	BEND
4”	45º
6”	45º

MATERIAL SPECIFICATION: 499-05-25-06

NOMENCLATURE:

PLUG, PVC

DESCRIPTION:

PVC Push-on plug used to plug end of sewer gravity pipes.
Shall conform to ASTM F1336-80, SDR-26.

SIZE

4”
6”
8”
10”
12”
15”
18”

MATERIAL SPECIFICATION: 499-05-29-01

NOMENCLATURE:

STOP, POLY

DESCRIPTION:

Plastic with rubber coating.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	DICKEY
6”	6”

MATERIAL SPECIFICATION: 499-05-99-01

NOMENCLATURE:

BEND, 11 1/4° DUCTILE IRON, MECHANICAL JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3″) through 36″. All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be bituminous coated by airless spray method. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND
4”	11 1/4°
6”	11 1/4°
8”	11 1/4°
12”	11 1/4°
16”	11 1/4°
20”	11 1/4°
24”	11 1/4°
30”	11 1/4°
36”	11 1/4°

***** CERTIFICATION REQUIRED *****

MATERIAL SPECIFICATION: 499-05-99-02

NOMENCLATURE:

BEND, 22 1/2° DUCTILE IRON, MECHANICAL JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be bituminous coated by airless spray method. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND
4”	22 1/2°
6”	22 1/2°
8”	22 1/2°
12”	22 1/2°
16”	22 1/2°
20”	22 1/2°
24”	22 1/2°
30”	22 1/2°
36”	22 1/2°

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-03

NOMENCLATURE:

BEND, 45° DUCTILE IRON, MECHANICAL JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be bituminous coated by airless spray method. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND
4”	45°
6”	45°
8”	45°
12”	45°
16”	45°
20”	45°
24”	45°
30”	45°
36”	45°

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-04

NOMENCLATURE:

BEND, 90° DUCTILE IRON, MECHANICAL JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be bituminous coated by airless spray method. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND
4”	90°
6”	90°
8”	90°
12”	90°
16”	90°
20”	90°
24”	90°
30”	90°
36”	90°

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-07

NOMENCLATURE:

BEND, 45° DUCTILE IRON, MECHANICAL JOINT X PLAIN END

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-05. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND	TYPE
4”	45º	MJ X PE
6”	45º	MJ X PE
8”	45º	MJ X PE
12”	45º	MJ X PE
16”	45º	MJ X PE
20”	45º	MJ X PE
24”	45º	MJ X PE
30”	45º	MJ X PE
36”	45º	MJ X PE

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-08

NOMENCLATURE:

BEND, 45° DUCTILE IRON, FLANGED

DESCRIPTION:

Fitting shall be ductile iron, conform ANSI A21.10/AWWA C-110 for standard fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Nuts and bolts shall be stainless steel. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	BEND
4”	45º
6”	45º
8”	45º
12”	45º
16”	45º
20”	45º
24”	45º
30”	45º
36”	45º

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-09

NOMENCLATURE:

BEND, 90°, DUCTILE IRON, FLANGED JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.10/AWWA C-110 for standard fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Nuts and bolts shall be stainless steel. Refer to Table WSCM 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

4”	90º
6”	90º
8”	90º
12”	90º
16”	90º
20”	90º
24”	90º
30”	90º
36”	90º

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-10

NOMENCLATURE:

WYE, SINGLE, PVC

DESCRIPTION:

PVC Wye conforming to ASTM F1336-80, SDR-26.

SIZE

8” x 6”
10” x 6”
12” x 6”
15” x 6”
18” x 6”

MATERIAL SPECIFICATION: 499-05-99-15

NOMENCLATURE:

WYE, SINGLE, DUCTILE IRON, MECHANICAL JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.53/AWWA C-153 for compact fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be bituminous coating. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE

4” x 4”
6” x 6”
8” x 8”
12” x 12”
16” x 16”
18” x 18”
20” x 20”
24” x 24”
30” x 30”
36” x 36”

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-16

NOMENCLATURE:

WYE, SINGLE, DUCTILE IRON, FLANGED

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.10/AWWA C-110 for standard fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Nuts and bolts shall be stainless steel. Refer to Table WSCM 110 and 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE

4” x 4”
6” x 6”
8” x 8”
10” x 10”
12” x 12”
16” x 16”
18” x 18”
20” x 20”
24” x 24”
30” x 30”
36” x 36”

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-21

NOMENCLATURE:

REDUCER, PVC

DESCRIPTION:

PVC Reducer conforming to ASTM F1336 SDR-26. For gravity sewer piping only.

SIZE

6” x 4”
8” x 6”

MATERIAL SPECIFICATION: 499-05-99-22

NOMENCLATURE:

REDUCER, BELL MOUTH, PVC

DESCRIPTION:

PVC, Bell Mouth Reducer conforming to ASTM F1336-80, SDR-26. For gravity sewer piping only.

SIZE

4” x 6”
4” x 8”
4” x 10”
4” x 12”
6” x 8”
6” x 10”
6” x 12”

MATERIAL SPECIFICATION: 499-05-99-23

NOMENCLATURE:

REDUCER, DUCTILE IRON, FLANGED JOINT

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.10/AWWA C-110 for standard fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Nuts and bolts shall be stainless steel. Refer to Table WSCM 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE

6” x 4”
8” x 4”
8” x 6”
10” x 6”
12” x 6”
12” x 8”
16” x 6”
16” x 8”
16” x 12”
20” x 6”
20” x 8”
20” x 12”
24” x 6”
24” x 8”
24” x 12”

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-25

NOMENCLATURE:

ADAPTOR, DUCTILE IRON, FLANGE X PLAIN END

DESCRIPTION:

Fitting shall be ductile iron, conform to ANSI A21.10/AWWA C-110 for standard fittings three inch (3") through 36". All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline and manufactured so as to distinctly indicate the pressure rating, nominal diameter of the openings, number of degrees or fraction of the circle, manufacturers identification, country where cast and the letters "DI" or "Ductile". Fittings shall be furnished with accessories. Nuts and bolts shall be stainless steel. Refer to Table WSCM 111 for estimated weights of fittings.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE	TYPE
4”	PE X FLANGE
6”	PE X FLANGE
8”	PE X FLANGE
12”	PE X FLANGE
16”	PE X FLANGE
18”	PE X FLANGE
20”	PE X FLANGE
24”	PE X FLANGE
30”	PE X FLANGE
36”	PE X FLANGE

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-31

NOMENCLATURE:

CLEANOUT HUB, PVC, THREADED/SLIP

DESCRIPTION:

PVC Threaded/Slip Adaptor conforming to ASTM F1336-80, SDR-26.

SIZE

4”
6”

MATERIAL SPECIFICATION: 499-05-99-32

NOMENCLATURE:

CLEANOUT PLUG, BRASS

DESCRIPTION:

Brass threaded recessed plug used in conjunction with PVC threaded/slip hub.

SIZE

4”

MATERIAL SPECIFICATION: 499-05-99-33

NOMENCLATURE:

CLEANOUT PLUG, PVC, THREADED

DESCRIPTION:

PVC Threaded Plug conforming to ASTM F1336-80, SDR-26.

SIZE

4”
6”

MATERIAL SPECIFICATION: 499-05-99-34

NOMENCLATURE:

CLEANOUT TEE, PVC

DESCRIPTION:

PVC Tee-Wye used to clean out sewer systems and shall conform to ASTM F1336-80, SDR-26. For gravity sewer piping only.

SIZE

6" x 6" x 4"
6" x 6" x 6"

MATERIAL SPECIFICATION: 499-05-99-35

NOMENCLATURE:

VENT HOOD

DESCRIPTION:

Stainless steel, vandal-proof, hooded vent cap with large frost proof openings, counter flashing collar, deep protective hood and recessed securing screws. Install with non-corrosive screen.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
4”	

MATERIAL SPECIFICATION: 499-05-99-35A

NOMENCLATURE:

VENT STACK, PVC

DESCRIPTION:

PVC, Schedule 80, vent stack with 90° sweep. Install with non-corrosive screen to prevent debris and bugs entering pipe on 90° sweep. For gravity piping only.

SIZE

4”
6”

MATERIAL SPECIFICATION: 499-05-99-36

NOMENCLATURE:

TEE, PVC, GASKETED

DESCRIPTION:

PVC fitting shall conform to ASTM F1336, SDR-26.

SIZE

8” x 8” TEE
10” x 10” TEE
12” x 12” TEE
15” x 15” TEE
18” x 18” TEE
24” x 24” TEE

MATERIAL SPECIFICATION: 499-05-99-40

NOMENCLATURE:

FLANGE, ADAPTOR

DESCRIPTION:

Cast iron flanged type adaptor with iron pipe threads.

The exterior of the fittings shall be epoxy coated as specified in 499-11-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the applicator has met the requirements of Section 499-11-99-03.

SIZE

4”
6”
8”
12”
16”
20”
24”

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-05-99-42

NOMENCLATURE:

BLIND FLANGE

DESCRIPTION:

Shall conform to ANSI B16.1, shall be ductile iron. The exterior of the flange shall be epoxy coated as specified in 499-11-99-04. The interior shall be factory applied amine cured epoxy as specified in 499-11-99-03.

SIZE

4”
6”
8”
12”
16”
20”
24”

MATERIAL SPECIFICATION: 499-05-99-51

NOMENCLATURE:

RESTRAINING DEVICE, MECHANICAL JOINT

DESCRIPTION:

Shall include a restraining mechanism which when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Restraining devices shall be of ductile iron, heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-headed bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1. The restraining device shall be primer coated and finish coated with epoxy paint specified in 499-11-99-05.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
	EBAA IRON, (OR EQUAL)	SIGMA-ONE LOK
SIZE		
4”	MEGALUG-1104	SLD
6”	MEGALUG-1106	SLD
8”	MEGALUG-1108	SLD
10”	MEGALUG-1110	SLD
12”	MEGALUG-1112	SLD
14”	MEGALUG-1114	SLD
16”	MEGALUG-1116	SLD
18”	MEGALUG-1118	SLD
20”	MEGALUG-1120	SLD
24”	MEGALUG-1124	SLD
30”	MEGALUG-1130	SLD

MATERIAL SPECIFICATION: 499-05-99-60

NOMENCLATURE:

CAM-LOCK ASSEMBLY

DESCRIPTION:

Cam-Lock Assembly shall be cam and groove type adaptor suitable for quick release and connection of pipes or hoses. Assembly shall consist of an adaptor and dust cap. Dust cap shall connect to the adaptor with a cam arm type locking device. Adaptor shall have NPT threads on one end and a grooved male coupling on the other.

SIZE

6” ADAPTOR
6” DUST CAP

MATERIAL SPECIFICATION: 499-05-99-65

NOMENCLATURE:

RESTRAINED FITTING, MEGA-LUG, DIP

DESCRIPTION:

Shall be ductile iron conforming to ANSI/AWWA C151/A21.51, latest version. All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi. The mega-lug shall be epoxy coated throughout.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER		
SIZE			
4″	EBAA IRON	SERIES 1100	SIGMA-ONE LOK SLD SERIES
6″			
8″			
10″			
12″			
16″			
18″			
20″			
24″			
30″			

MATERIAL SPECIFICATION: 499-05-99-70

NOMENCLATURE:

SADDLE, TAPPING, STAINLESS STEEL

DESCRIPTION:

Tapping saddle shall be all stainless steel T-304, per ASTM A-240. All welds and metal surfaces shall be chemically passivated to meet ASTM A-380. All saddles to be certified to ANSI/NSF-61. Saddles to be two-piece construction with two inch (2") outlet with IPS thread. Saddles to have double bolt and received bars. Bolts and nuts to be 18-8 stainless steel. Saddle shall be rated for 150 psi.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
SIZE	FORD	CASCADE
4" x 2"	FRS202-535-TAP	CS22-0566-TAP
6" x 2"	FRS202-760-TAP	CS22-0733-TAP
8" x 2"	FRS202-979-TAP	CS22-0982-TAP
10" x 2"	FRS202-1225-TAP	CS22-1155-TAP
12" x 2"	FRS202-1440-TAP	CS22-1360-TAP
16" x 2"	FRS202-1800-TAP	CS22-1750-TAP
18" x 2"	FRS202-2000-TAP	CS22-2050-TAP
20" x 2"	FRS202-2220-TAP	CS22-2280-TAP
24" x 2"	FRS202-2640-TAP	CS22-2700-TAP

MATERIAL SPECIFICATION: 499-07-06-02

NOMENCLATURE:

PIPE, PVC, 3034 DR 26

DESCRIPTION:

PVC pipe used for gravity sewer pipe, shall conform to ASTM 3034-SDR 26, and be green in color.

The pipe manufacturer must supply a Certificate of Application that the pipe has met requirements of ASTM 3034-SDR26.

SIZE

6”
8”
10”
12”
15”
18”
24”

*****CERTIFICATION REQUIRED*****

MATERIAL SPECIFICATION: 499-07-15-01

NOMENCLATURE:

PIPE, DUCTILE IRON, PUSH-ON, EPOXY LINED

DESCRIPTION:

Pipe shall be ductile iron, conforming to the latest requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, Pressure Class, rated for a minimum 200 psi working pressure (or project requirements, whichever is greater) plus a 100 psi minimum surge allowance and a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of 4 feet. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture. Pipe diameters four inch (4") through 12" shall be class 350 minimum, diameters 14" through 20" shall be class 250 minimum and pipe diameters 24" and larger shall be class 200 minimum. Pipe shall have an exterior bituminous coating applied by airless spray method. Pipe shall have an interior Amine Cured Epoxy Lining as specified in Section 499-11-99-03. All pipe shall be furnished with Push-On type joints. Joints shall be in accordance with ANSI/AWWA C111/A21.11, latest revision, and be furnished complete with all necessary accessories. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe. Pipe with cracked or chipped linings or defects in the pipe will be rejected.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the lining applicator has met the requirements of Section 499-11-99-03. Applicators need to make sure quality control is met by ensuring each pipe is properly coated.

SIZE

4” CLASS 350
6” CLASS 350
8” CLASS 350
10” CLASS 350
12” CLASS 350
14” CLASS 250
16” CLASS 250
18” CLASS 250
20” CLASS 250
24” CLASS 200
30” CLASS 200
36” CLASS 200

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-07-20-01

NOMENCLATURE:

PIPE, HDPE, FUSION

DESCRIPTION:

HDPE directional bored pressure pipe shall conform to C906 AWWA latest edition with a DR-11, 160 psi or DR-9, 200 psi pressure rating, with color coded green striping.

SIZE

4”	C906
6”	C906
8”	C906
10”	C906
12”	C906
16”	C906
18”	C906
20”	C906
24”	C906
30”	C906
36”	C906

MATERIAL SPECIFICATION: 499-07-15-02

NOMENCLATURE:

RESTRAINED JOINT PIPE, DUCTILE IRON

DESCRIPTION:

Joint shall be restrained using grip gaskets or lock-rings as described below.

APPROVED MANUFACTURING AND CATALOG NUMBERS

MANUFACTURER	
AMERICAN	Ductile Iron Pipe, Fast-Grip Restrained Gaskets, Lok-Ring restrained rings
MC WANE	Ductile Iron Pipe, Field Lok Restrained Gaskets, Super-Lock restrained rings
GRIFFIN	Ductile Iron Pipe, Field Lok Restrained Gaskets, Snap-Lok restrained rings
U.S.	Ductile Iron Pipe, Field Lok Restrained Gaskets, TR Flex Gripper restrained rings
EBBA IRON	Ductile Iron Pipe, Mega-Lug restraint harness, Series 1700

MATERIAL SPECIFICATION: 499-07-99-01

NOMENCLATURE:

PIPE, PVC, SOLVENT WELD, SCH 80

DESCRIPTION:

Schedule 80 PVC pressure pipe conforming to ASTM D-1785, 200 psi, color green.

SIZE

4”
6”
8”

MATERIAL SPECIFICATION: 499-07-99-04

NOMENCLATURE:

PIPE, PVC, FUSION

DESCRIPTION:

PVC directional bored pressure pipe shall conform to C900 and C905 AWWA latest edition with a DR-18, 200 psi pressure rating, color green.

SIZE

4”	C900
6”	C900
8”	C900
10”	C900
12”	C900
16”	C905
18”	C905
20”	C905
24”	C905
30”	C905
36”	C905

MATERIAL SPECIFICATION: 499-07-99-05

NOMENCLATURE:

PIPE, PVC, C-900, DR-18

DESCRIPTION:

PVC pressure pipe shall conform to C-900/C-905 AWWA latest edition with a DR18, 200 psi pressure rating, color green, gasketed bell joint.

The pipe manufacturer must supply a Certificate of Application that the pipe has met requirements of C-905 AWWA, DR-18.

SIZE

4” C-900
6” C-900
8” C-900
12” C-900
18” C-905
20” C-905
24” C-905

*****CERTIFICATION REQUIRED*****

MATERIAL SPECIFICATION: 499-07-99-06

NOMENCLATURE:

RESTRAINED JOINT PIPE, PVC

DESCRIPTION:

Joint shall be restrained using Certa-Lok C900 restrained joint PVC piping system or bell restraint harnesses.

APPROVED MANUFACTURING AND CATALOG NUMBERS

MANUFACTURER	
CERTAIN TEED	Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR14 and DR18 pipe
EBBA IRON	Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR14 and DR18 pipe

MATERIAL SPECIFICATION: 499-07-99-15

NOMENCLATURE:

PIPE, DUCTILE IRON, FLANGED, EPOXY LINED

DESCRIPTION:

Pipe shall be ductile iron conforming to the latest requirements of ANSI/AWWA C151/A21.51, Pressure Class, rated for a minimum 200 psi working pressure (or project requirements, whichever is greater) and a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of four (4) feet. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture. Pipe shall have an exterior epoxy coating as specified in section 499-11-99-04. Pipe shall have an interior Amine Cured Epoxy Lining as specified in Section 499-11-99-03. All pipe shall be furnished with Flanged type joints. Joints shall be in accordance with ANSI/AWWA C111/A21.11, latest revision, and be furnished complete with all necessary accessories. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.

The pipe or fitting manufacturer must supply a "Certificate of Application" that the lining applicator has met the requirements of Section 499-11-99-03.

SIZE

4” CLASS 350
6” CLASS 350
8” CLASS 350
10” CLASS 350
12” CLASS 350
14” CLASS 250
18” CLASS 250
20” CLASS 250
24” CLASS 200
30” CLASS 200
36” CLASS 200

*** * * C E R T I F I C A T I O N R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-10-07-02

NOMENCLATURE:

VALVE, PLUG ECCENTRIC

DESCRIPTION:

To valve off sewage force mains and lift stations, shall come with mechanical joint ends and shall come with accessories. Plug valves shall have a "solids" handling capability utilizing a ful-flo round port opening and shall not be less than 81% on valves not to exceed 24". Resilient plug valve shall be permanently lubricated eccentric type with resilient faced plugs. Valve bodies shall be of ASTM A-126 Class B semi-steel to conform to AWWA standard C507-73 Section 5.1 and AWWA Standard C504-80 Section 6.4. Valve pressure rating shall be as follows and shall be established by hydrostatic test as specified by ANSI standard B16.1-1967 pressure rating shall be 175 psi working pressure for all valves through 12". All valves shall be equipped with two inch (2") square operating nut on all sizes through 24", all bolts on plug valves through 24" shall be stainless steel for non-buried service valves. Shall be epoxy coated inside and out. The resilient plug shall be Buna-N or neoprene coated, also all valves 10" and up shall be equipped with gear actuators.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER			
SIZE	CLOW	VAL-MATIC	DE ZURIK	PRATT
4”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
6”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
8”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
12”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
16”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
20”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC
24”	F-5413	SERIES 5000	SERIES 100	BALLCENTRIC

MATERIAL SPECIFICATION: 499-10-99-01

NOMENCLATURE:

VALVE, AIR RELEASE

DESCRIPTION:

Shall be of the type designed for use in sewage force mains to exhaust entrapped air during filling. Valve shall be simple lever type and constructed to 175 psi working pressure, have stainless steel inner working parts with cast iron body and cover, NPT threaded inlet and outlets. Valves shall be furnished with required backwash accessories.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
SIZE	EMPIRE	VAL-MATIC
1”	FIG. 935-F	VALVE NO. 15
2”	FIG. 935-A	VALVE NO. 45

MATERIAL SPECIFICATION: 499-10-99-02

NOMENCLATURE:

PVC VALVE, AIR RELEASE

DESCRIPTION:

Shall be of the type designed for use in sewage force mains to exhaust entrapped air during filling. Valve shall be simple lever type and constructed to 175 psi working pressure, have plastic and stainless steel inner working parts with PVC body and cover, NPT threaded inlet and outlets. Valves shall be furnished with required backwash accessories.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	ARI FLOW CONTROLS
1”	025-PN10
2”	025-PN10

MATERIAL SPECIFICATION: 499-10-99-10

NOMENCLATURE:

CHECK VALVE, SPRING & LEVER TYPE, FLANGED, EPOXY LINED

DESCRIPTION:

Check valve shall meet the requirements of AWWA C508, be ductile iron body, bronze mounted with flanged ends conforming to ANSI B16. Valve Class 125 shall have bronze disc facing, o-ring sealed stuffing box, adjustable weight to control opening and closing of clapper, lever can be installed on either side. Shall be designed to operate at working pressure of 175 psi.

The exterior of the valve shall be coated as specified in section 499-10-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The manufacturer must supply a "Certificate of Application" that the applicator has met the requirement of Section 499-11-99-03.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
SIZE	M & H	AVK
4”	STYLE 259-02	SERIES 41
6”	STYLE 259-02	SERIES 41
8”	STYLE 259-02	SERIES 41
10”	STYLE 259-02	SERIES 41
12”	STYLE 259-02	SERIES 41

***** SHOP DRAWING REQUIRED *****

***** CERTIFICATION REQUIRED *****

MATERIAL SPECIFICATION: 499-10-99-11

NOMENCLATURE:

CHECK VALVE, SWING-FLEX TYPE, FLANGED, EPOXY LINED

DESCRIPTION:

Check valve shall meet the requirements of AWWA C508, be ductile iron body, bronze mounted with flanged ends conforming to ANSI B16. Valve Class 125 shall have bronze disc facing, o-ring sealed stuffing box, adjustable weight to control opening and closing of clapper, lever can be installed on either side. Shall be designed to operate at working pressure of 175 psi.

The exterior of the valve shall be coated as specified in section 499-10-99-04. The interior lining shall be a factory applied amine cured epoxy as specified in Section 499-11-99-03.

The manufacturer must supply a "Certificate of Application" that the applicator has met the requirement of Section 499-11-99-03.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	VALMATIC
4”	504-A
6”	506-A
8”	508-A
10”	510-A
12”	512-A

***** SHOP DRAWING REQUIRED *****

***** CERTIFICATION REQUIRED *****

MATERIAL SPECIFICATION: 499-11-31-05

NOMENCLATURE:

LINER, CALCIUM ALUMINATE CEMENT

DESCRIPTION:

Monolithic fiber-reinforced structural/structurally enhanced pure calcium aluminate cementitious liner for the purpose of providing corrosion protection for new manholes and wet wells and the repair of cracks and voids and restoration of the structural integrity of existing manholes. Liner shall be one inch (1") minimum thickness. The first coat shall be applied at a thickness adequate to cover the substrate and be troweled to compact the material into voids and set the bond. The second coat shall be applied to ensure complete coverage at the specified one inch (1") minimum thickness. Inverts shall be lined with patching mix, trowel applied in one coat to one inch (1") minimum thickness. Cleaning, preparation of the manhole wall and application shall be in strict accordance with the manufactures detailed instructions.

APPROVED MANUFACTURING AND CATALOG NUMBERS

MANUFACTURER		
LAFARGE	QUADEX	STRONG SYSTEMS, INC.
SEWPERCOAT	ALUMINALINER	STRONG-SEAL

MATERIAL SPECIFICATION: 499-11-99-01

NOMENCLATURE:

LINK SEAL

DESCRIPTION:

Interconnecting solid rubber linkage interconnected with bolt used to seal piping that pass through walls.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	THUNDERLINE CORP, (OR EQUAL)
4”	
6”	
8”	
12”	
18”	
24”	

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-02

NOMENCLATURE:

COATING, BITUMINOUS

DESCRIPTION:

Bituminous coating applied in two coats. Total minimum dry film thickness shall be 12 mils. Each coat shall be applied at the rate of one gallon per 100 square feet. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

APPROVED MANUFACTURING AND CATALOG NUMBERS - Koppers, Tnemec, or equal.

MANUFACTURER	
KOPPERS	TNEMEC
BITUMASTIC NO. 300	46-413

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-03

NOMENCLATURE:

LINING, AMINE CURED EPOXY

DESCRIPTION:

Two component amine novalac cured epoxies of at least 87% solids and 20% by volume of ceramic quartz pigmented in the dried film. Minimum film thickness shall be 40 mils dry film thickness. The ceramic epoxy shall have a permeability rating of zero permeance when a film of at least 40 mils is tested according to ASTM D1653-79. A permeability rating of 0.0 perms shall be achieved when measured using method A of ASTM E66-96 with a test duration of 42 days.

Surface preparation, curing times, number of coats, and the application methods shall be as contained in the lining material manufacturer's published literature. Ductile iron pipe shall be checked for thickness using a magnetic film thickness gauge. Thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness testing. The lining material shall not be applied above the thickness per coat as recommended in the manufacturer's printed literature. Each pipe joint and fitting shall be marked with the date of the application of the lining system and with its numerical sequence of application on that date.

The applicator must supply a "Certificate of Application" attesting to the fact that he has met the requirements specified above and that the material was applied and tested as specified hereinbefore. In addition the applicator shall also furnish a product number of his recommended repair compound for sealing ends of cut pipe or repairing damaged linings.

APPROVED MANUFACTURING AND CATALOG NUMBERS

MANUFACTURER	
FAST FABRICATORS	INDERALL
SP-2000W	PROTECTO 401

***** SHOP DRAWING REQUIRED *****

***** CERTIFICATION REQUIRED*****

MATERIAL SPECIFICATION: 499-11-99-04

NOMENCLATURE:

COATING, EXPOSED METAL AND PIPING

DESCRIPTION:

Metal and piping coating applied in three (3) coats. Polyamide, anti-corrosive epoxy primer applied in one coat, minimum of three (3) mils. Polyurethane enamel applied in two coats at a minimum of three (3) mils each. Total mils for piping and metal shall be a minimum of nine (9) mils.

APPROVED MANUFACTURING AND CATALOG NUMBERS - Koppers, Tnemec, or equal.

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-05

NOMENCLATURE:

COATING, SUBMERGED METAL AND PIPING (HIGHLY CORROSIVE)

DESCRIPTION:

Metal and piping coating applied in three (3) coats. Polyamide, anti-corrosive epoxy primer applied in one coat, minimum of three (3) mils. Polyamide epoxy-coal tar applied in two (2) coats at a minimum of eight (8) mils each. Total mils for piping and metal shall be a minimum of 19 mils.

APPROVED MANUFACTURING AND CATALOG NUMBERS - Koppers, Tnemec, or equal.

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-06

NOMENCLATURE:

COATING, MANHOLES (MILDLY CORROSIVE)

DESCRIPTION:

Concrete coating applied in two (2) coats. Polyamide, epoxy-coal tar applied in two coats, minimum of eight (8) mils. each. Total mils for concrete shall be a minimum of 16 mils.

APPROVED MANUFACTURING AND CATALOG NUMBERS –

GML
RAVEN

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-08

NOMENCLATURE:

COATING, CONCRETE WET WELLS AND MANHOLES (HIGHLY CORROSIVE)

DESCRIPTION:

Concrete coating applied in two (2) coats. epoxy sealer applied by trowel or spray, ⅛" thick minimum.

APPROVED MANUFACTURING AND CATALOG NUMBERS

GML
RAVEN

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-21

NOMENCLATURE:

BACKFLOW PREVENTER, REDUCED PRESSURE

DESCRIPTION:

Reduced pressure zone backflow preventer designed to prevent back-siphonage and backpressure backflow of contaminated water into the potable water supply. Backflow Preventer shall be of bronze construction with stainless steel seats, shafts and flange bolts, durable tight seating rubber check valve and relief valve assemblies and bronze body ball valve test cocks. Backflow Preventer to be furnished with N.P.T. body connections.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER					
SIZE	WATTS	FEBCO	HERSEY	CONBRACO	AMES	CLA-VAL
3/4”	709QT	825Y	FRP-2	40-200	4000SS	DC7LW

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-11-99-30

NOMENCLATURE:

PRECAST CONCRETE POST

DESCRIPTION:

Pre-cast concrete post with 4,000 psi concrete and one (1) #4 bar. Cement shall meet the requirements of ASTM C150-latest, Specification for Portland Cement, Type I/II.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
4" x 4" x 8"	DEL ZOTTO, HANSON PIPE & PRODUCTS, (OR EQUAL)

MATERIAL SPECIFICATION: 499-11-99-31

NOMENCLATURE:

LADDER, FIBERGLASS

DESCRIPTION:

Fiberglass ladder complying with OSHA, pp. 1910.27 entitled "Fixed Ladders", able to withstand a 1,200 pound vertical concentrated load at mid-span of a rung. Use channel side rails and one and three-eighths inch (1 ⅜") minimum diameter rungs with factory applied Epoxy/Glass Bead non-skid coating. Standoff clips to be provided for every six feet (6') of ladder height.

APPROVED MANUFACTURING AND CATALOG NUMBERS - IMCO Reinforced Plastics, Fibergrate Company, or equal.

MATERIAL SPECIFICATION: 499-11-99-42

NOMENCLATURE:

FLUORESCENT LIGHT

DESCRIPTION:

Shall be standard two (2) tube fluorescent light fixture with transparent plastic cover. Fixture must be fabricated out of non-corrosive material, must be water tight, and all mounting hardware shall be stainless steel.

APPROVED MANUFACTURING AND CATALOG NUMBERS

SIZE	MANUFACTURER
48”	

MATERIAL SPECIFICATION: 499-12-99-03

NOMENCLATURE:

PUMP STATION, SUBMERSIBLE

DESCRIPTION:

Shall be a factory built pumping system consisting of two (2) submersible pumps complete with motor control system guide rail and anchoring brackets, power cable, and pump lifting cable.

The discharge connection for each pump elbow shall be permanently installed in the pump station along with the discharge piping. The pumps shall be automatically connected to the discharge connection elbow when lowered into place. There should be no need for personnel to enter the wet well for pump maintenance or pump removal. Sealing of the pumping unit shall be accomplished by a simple linear downward motion of the pump along the guide cable system.

The guide rail system shall be an integral part of the pump unit using Type 316 stainless steel guides in parallel and secured to the discharge connection elbow.

NOTE: Refer to Project Specifications for pump requirements and Section 498-4.1 for detailed technical specifications.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER	
SIZE	GORMAN-RUPP	FLYGT
4”	SUBMERSIBLE	SUBMERSIBLE
6”	SUBMERSIBLE	SUBMERSIBLE
8”	SUBMERSIBLE	SUBMERSIBLE

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-12-99-10

NOMENCLATURE:

SUMP PUMP

DESCRIPTION:

Pump shall be submersible type designed to handle maximum ¾" solids with cast iron body, stainless steel hardware, two vane bronze impeller, 1-1/4" NPT discharge port, single-phase, 120V.

APPROVED MANUFACTURING AND CATALOG NUMBERS

	MANUFACTURER
SIZE	HYDROMATIC, MYERS, PROSSER/ENDO, OR EQUAL
1/4 HP	
1/3 HP	

MATERIAL SPECIFICATION: 499-12-99-11

NOMENCLATURE:

SUMP PUMP, SUBMERSIBLE

DESCRIPTION:

Pump shall be cast iron construction with stainless hardware and accessories, three inch (3") NPT discharge with a full two inch (2") inlet, non-clogging vortex impeller which passes 2" solids, UL Listed and CSA approved, automatic reset thermal overload protection, hermetically sealed, oil filled, single-phase motor, PSC design, mechanical seals with stainless steel, Buna N, and carbon/ceramic parts. Pump shall be designed to operate on 115V, 60Hz, single-phase. All mounting hardware must be stainless steel.

APPROVED MANUFACTURING AND CATALOG NUMBERS - Hydromatic, Zoeller, or equal

	MANUFACTURER	
SIZE	ZOELLER	HYDROMATIC
1/2 HP	ZP 553	

***** SHOP DRAWING REQUIRED *****

MATERIAL SPECIFICATION: 499-12-99-20

NOMENCLATURE:

FLOAT, BALL TYPE

DESCRIPTION:

Mercury-free float switch for controlling liquid levels in a variety of applications and shall have a snap-action switch activated by a steel ball rolling back and forth within a switching tube in a polypropylene plastic float housing. Minimum differential between "on" and "off" shall be approximately 3.5 inches. All mounting hardware must be stainless steel.

APPROVED MANUFACTURING AND CATALOG NUMBERS - Eco-Float or equal

	MANUFACTURER
TYPE	ECO-FLOAT
BALL	MODEL G-GSI40NO

MATERIAL SPECIFICATION: 499-12-99-21

NOMENCLATURE:

LIFT STATION MAIN DISCONNNECT

DESCRIPTION:

Lift station main disconnect panel shall include but not be limited to a stainless steel NEMA 4X cabinet, main disconnect, lightning arrestor, and surge suppressor. Cabinet and accessories shall be assembled in accordance with Detail 498-4.1A(2) and 498-4.1B(2).

APPROVED MANUFACTURING AND CATALOG NUMBERS - Square D, Siemens, or equal.

*****SHOP DRAWING REQUIRED*****

MATERIAL SPECIFICATION: 499-12-99-31

NOMENCLATURE:

LIFT STATION MAIN ELECTRICAL PANEL

DESCRIPTION:

Lift station control panel shall include but not be limited to a stainless steel NEMA 3R cabinet, Digital Controller, breakers, relays, fuse holders, air pumps, alarm light, alarm horn, lightning arrestor, generator receptacle, phase loss monitor, transformer, GFI receptacle, motor starters, wiring, and terminal board. Cabinet and accessories shall be assembled in accordance with Detail 498-4.1. All hardware must be stainless steel.

APPROVED MANUFACTURING AND CATALOG NUMBERS -

*** * * S H O P D R A W I N G R E Q U I R E D * * ***

MATERIAL SPECIFICATION: 499-13-99-01

NOMENCLATURE:

REMOTE TERMINAL UNIT ASSEMBLY

DESCRIPTION:

Remote Terminal Unit (RTU) shall be a microcomputer-based data collection and dissemination subsystem. The remote terminal unit shall communicate with the central site via a two-way radio link. The remote terminal unit shall be designed to accommodate plug-in function modules. The system shall be capable of being outfitted, at any time, with RTU's capable of being configured with up to fifteen (15) function modules per RTU, with no software or firmware changes to the system. All sheet metal utilized inside the enclosure must be anodized. The RTU assembly shall include but not be limited to Control Box with modules, connecting antenna cable, antenna tower, antenna mast, antenna and all hardware necessary for a complete and operational RTU.

NOTE: Refer to Section 495-3.7 for detailed specifications.

APPROVED MANUFACTURING AND CATALOG NUMBERS