**CITY OF BILOXI**

**SPECIAL PROVISION NO. 907-624-1 CODE: (SP)**

**DATE: 05/18/2023**

**SECTION 624 - SANITARY SEWER LINES AND APPURTENANCES**

**624.01 - Description.** The work covered by this section consists of furnishing all labor, equipment and materials and performing all operations in connection with the installation of sanitary sewer lines, as indicated on the plans and as specified herein. The work includes clearing, grubbing, trenching, dewatering, bedding, pipe laying, backfilling, testing, bypass pumping, connections to existing manholes, fittings, and appurtenances required for a complete installation.

**624.02 - Materials.**

**624.02.1 - Polyvinyl Chloride (PVC) Sewer Pipe.** Polyvinyl chloride sewer pipe with a diameter of six inches (6") or larger, including pipe for house connections, shall be specifically designed to carry domestic sewage by gravity flow and shall be green in color and shall meet the requirements of ASTM D3034-81 with a maximum SDR equal to 26 and a minimum F/AY stiffness of 115 psi when tested in accordance with ASTM D2412. An acceptable equivalent is AWWA C900-07, DR 18 pipe (green in color).

All joints shall consist of an integral bell with a factory installed "locked in" elastomeric gasket. The spigot end of each joint shall be factory beveled.

All fittings shall be standard manufactured fittings, which meet the requirements of ASTM D3034-81 SDR-26 or AWWA C900-07, DR 18 pipe.

**624.02.2 – Large Diameter PVC Sewer Pipe.** Large diameter PVC sewer pipe shall be any pipe 18” or greater. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions and other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

PVC solid wall pipe and fittings shall be manufactured in accordance with the requirements of ASTM F 1803, D3034, F679, and D1784, latest edition with the following additional performance requirements.

The pipe shall meet a minimum pipe stiffness of 115 psi (PS-115).

Pipe 30 inches and larger shall be capable of passing an impact test of 440 ft/lbs when tested at time of production in accordance with the test procedure found in ASTM F 1803. Independent laboratory certification shall be provided with the submittal that the pipe has been tested and been found capable of meeting this requirement.

PVC solid wall pipe joints shall be the bell and spigot type, water-tight, and shall conform to ASTM D 3212.

Gaskets shall meet the requirements of ASTM F 477 and be molded into a circular form or extruded to the proper section, then spliced into circular form, and shall be made of a properly cured high grade elastomeric compound.

Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Field installed gaskets and field cut beveled lengths of pipe shall be done in accordance with the manufacturer’s instructions and recommended equipment and materials.

All pipe gaskets and spigots will be thoroughly cleaned and lubricated before assembly.

Factory tapered spigot ends shall be made of PVC and shall be formed during the manufacturing process by heating the inner and/or outer wall and remolding. The use of putty, filler, rubber or plastic inserts or wedges to form either the inner or outer wall of the pipe will not be allowed on spigots or bells.

**624.02.3 - Ductile Iron Sewer Pipe.** Ductile iron pipe for gravity sewers or sewer force main shall conform to ANSI Specifications A21-51. Wall thickness shall not be less than Class 50 unless otherwise specified. The words "Ductile Iron" and thickness class shall be conspicuously marked on each joint of pipe. Pipe shall be furnished with a coal tar coating inside and outside.

Mechanical joints shall meet the requirements of ASA A-21.11 except as amended by ASA A-21.51.

Fittings for ductile iron pipe shall be mechanical joint ductile iron castings with a coal tar coating in accordance with ANSI-AWWA C110/A21.10.

Bolting shall be of the type recommended by the pipe supplier and shall be of a material with a minimum 45,000 psi tensile strength, with semi-finished heavy nuts in accordance with ANSI/AWWA C111/A21.11.

**624.02.3.1 – Polyethylene Encasement.** Provide 8 mil minimum thickness polyethylene encasement (wrap) on all buried ductile iron pipe, fittings, and accessories in accordance with AWWA C105 (ANSI A21.5). Polyethylene encasement materials shall consist of three layers of co-extruded linear low-density polyethylene (LLDPE), fused into a single layer. The inside surface of the polyethylene wrap shall be infused with an antimicrobial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion. The color shall be while. Produce and manufacturer shall be V-Bio® Enhanced Polyethylene Encasement, or approved equal.

**624.02.4 - Connectors and Adapters.** Connectors and adapters shall be especially made for joining pipes of different materials and diameters. Pipe connectors between two different types of pipes shall be made by using flexible couplings with stainless steel shear rings with necessary donuts and bushings as required. These couplings will be 1002, 1003, 1006, 1051, and the 1056 series as manufactured by Fernco or equal. All connectors must comply with the requirements of ASTM C425.

**624.02.5 - Pipe Gaskets at Manholes.** Gaskets around PVC pipe as it passes through the wall of new or existing sanitary manholes shall be flexible concrete manhole adapters or waterstops as manufactured by Fernco or equal.

**624.02.6 - Grout.** An approved non-shrink grout shall be used for all necessary grouting.

**624.02.7 - Polyvinyl Chloride (PVC) Pressure Pipe for Force Mains.** PVC sanitary sewer force mains shall be in accordance with AWWA C-900-07, SDR18, approved by the National Sanitation Foundation (NSF) and shall be U.L. listed. Pipe shall be white or green in color and furnished in standard lengths (minimum 20 feet) with integrally cast bells or couplings using elastomeric gaskets, which meet the requirements of ASTM D3139 and F477. All necessary adapters and retaining glands for connection to fittings shall be provided.

**624.02.8 - Fittings for Force Mains.** Fittings for sewer force mains of four-inch (4") diameter and larger shall be seal coated ductile iron with mechanical joint ends. Mechanical joints shall be recommended by the manufacturer for use with AWWA C900 pipe. Fittings shall be manufactured in accordance with AWWA C104. Bolts shall be of the type recommended by the pipe supplier and shall be of material with a minimum 45,000 psi tensile strength with semi-finished heavy nuts in accordance with ANSI/AWWA C111/A21.11.

**624.02.9 - Air Release Valves.** Valves shall function automatically to release to the atmosphere air that may accumulate in the pipeline, and shall prevent leakage of wastewater. Each valve shall be furnished with all required accessories for maintenance of the valves.

Materials used in manufacture of air release valves and accessories shall be new and shall be in accordance with all ASTM and other industry standards and as specified herein.

The body and cover shall be cast iron Class 30 in accordance with ASTM A48 or Class B in accordance with ASTM A126.

The float and guide shaft shall be stainless steel in accordance with ASTM A240.

The internal linkages shall be stainless steel in accordance with ASTM A240; or bronze in accordance with ASTM B584; or delrin in accordance of ASTM D2133.

**624.02.9.1 - Design.** The valve shall have a float stem and body, which keeps the valve operating mechanism as free from contact with the sewage as possible. The float shall hang freely in the center of the valve body with about one half inch (1/2") clearance all around to prevent large solids getting above the float and float's free suspension.

The valve inlet shall have an internal diameter of four inches (4") and shall have a minimum orifice diameter of 7/16 inches.

The air release valve required in each manhole shall be carefully evaluated. The overall height of the valve shall be such that when in place, as indicated on the plans, a minimum clearance between the top of the valve cover and the bottom of the concrete slab of the manhole shall be six inches (6"). Whenever possible, the valve furnished shall be such that when in place the clearance between the valve cover and the bottom of the concrete slab shall permit removal of the internal float and guide shaft without dismantling the valve.

The valve and accessories shall be suitable for operation at pressures of seventy-five pounds per square inch (75 psi).

The valve inlet end shall be flanged in accordance with ANSI 816.1, Class 125 and as required to match the valve to which it connects. The valve shall be vented by installing one inch (1”) schedule 40 pipe to the nearest sanitary sewer manhole. The one-inch (1”) pipe shall be installed to a minimum grade of one-eighth inch (1/8”) fall from the valve to the manhole.

**624.02.9.2 - Accessories.** Each valve shall be constructed to permit the flushing out of any sediment, which may settle or otherwise impede the operation of the valve.

All accessories including valves, rubber hoses, quick disconnect couplings and other equipment required for flushing out sediment and de-clogging orifices shall be furnished and assembled to the valve.

**624.02.10 - Bedding Material.** Aggregate bedding material shall meet the requirements of “Size II Stabilizer Aggregate of Section 907-304-1 or “Borrow Excavation” of Section 907-203-1. Bedding material is required where directed by the City Engineer or his authorized representative. For pipe diameters larger than 18”, pipe bedding shall be in accordance with ASTM D2321 and aggregate bedding shall meet the requirements of “Size II Stabilizer Aggregate” of Section 907-304-1.

**624.02.11 - Marking Tape & Locator Wire.** Metallic marking tape shall be placed in all trenches at a depth of one foot (1’) above sanitary sewer service lines, sanitary sewer gravity lines and sanitary sewer force mains. Tape shall be three inches (3") wide metallic tape with the words "CAUTION SEWER LINE BURIED BELOW" printed on it for all sanitary sewer service lines and sanitary sewer gravity lines, and "CAUTION FORCE MAIN BURIED BELOW" printed on it for all force main installations. No additional compensation will be allowed for this operation.

All sanitary sewer gravity lines, sanitary sewer force mains, & sanitary sewer services shall be installed with a fourteen (14) gauge solid copper insulated locator wire placed directly on the center of the sewer line for its entire length. Wire shall be tied to a step inside the sanitary sewer manhole and shall be a continuous piece of wire for its entire length. For sanitary sewer services and force mains the locator wire shall be tied to an appurtenance at the start of the new service or main and shall be a continuous piece of wire for its entire length. The Contractor shall supply the splice kits and other accessories necessary for one continuous locator wire. No additional compensation will be allowed for this operation.

**624.02.12 - Sewer Clean-out Plugs.** All sanitary sewer clean-out plugs shall be brass with a countersunk nut as manufactured by Plumbest, “P51-600”, or approved equal.

**624.03 - Construction Requirements.**

**624.03.1 - Sewer Flow Control.** The City will assist in lift station operations during work on the sewer system. The Contractor will not shutdown any pump stations in the collection system, if such is necessary, for the performance of this work. The Contractor shall notify the Owner who shall supply an operator for the lift station.

**624.03.1.1 - Plugging or Blocking.** When sewer line flows are low, lines may be blocked or plugged with City approval while work is performed on the lines. The Contractor is responsible for monitoring the effects of this blockage to prevent overflow of sewage and damage or inconvenience to the citizens.

**624.03.1.2 - Bypassing-Pumping.** When bypass-pumping from one manhole to the next, around a manhole or segment of force mains or portions of sewer lines to be replaced is required, the Contractor shall supply the necessary pumps, conduits and other equipment to divert the flow of sewage around the sewer section on which work is to be performed. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate on a 24-hour basis and all engines shall be equipped with super silencers. The Contractor shall be responsible for correcting any problems that arise as a result of bypassing-pumping operations.

**624.03.2 - Trenching.** The Contractor shall comply with the sewer flow control requirements of Subsection 624.03.1 before conducting any trenching operations that cut into existing sewer lines or force mains.

Trenches shall be excavated only so far in advance of pipe removal and laying as to reveal obstructions, and shall be dug so that the existing pipe can be removed and, if applicable, the new pipe can be laid to the alignment and depth required. Excavation shall be done so as to provide a uniform and continuous bearing support for the pipe on solid and undisturbed ground at every point between bell holes. Bell holes shall be excavated at each joint to permit the proper joining of pipe sections. Where trench conditions are such that adequate support for the pipe cannot be obtained on the native material, aggregate bedding shall be used only with the approval of the City Engineer or his authorized representative, in accordance with Section 624.02.10 Pipe Bedding.

The width of the trench shall be ample to permit the existing pipe to be removed and the new pipe to be laid and jointed properly and the backfill to be placed and compacted as specified but in no case less than as follows:

Pipe Diameter Minimum Trench Width

18” – 110” Pipe O.D. +18”

For pipe diameters 18” and above, trench walls below the elevation of the pipe crown should be maintained as vertical as possible. A minimum of 6 inches of the select bedding material shall be provided under the pipe in accordance with Section 624.02.10 Pipe Bedding. Where unstable trench bottoms are encountered corrective action needs to be taken in accordance with the ASTM D2321 Section 7.2.2. Where excavation or caving causes excavation within the pipe zone to be wider than specified, the Contractor shall remove all loose and sloughed in material from the trench and replace with the select backfill material.

No greater length of trench shall be opened in advance of a completed pipeline nor left unfilled to the rear than shall seem proper to the City Engineer or his authorized representative. No trench shall be left without being backfilled at the end of a workday.

**624.03.3 - Sheathing and Shoring.**  The Contractor shall place such sheathing and shoring in the trenches or utilize a trench box as may be necessary to properly support the trench walls and any adjacent structures. The type and amount of sheathing and shoring shall be such as the nature of the ground and attendant condition may require. It shall be the sole responsibility of the Contractor to provide such sheathing, shoring and bracing as may be required for the safe conduct of the work. The City Engineer or his authorized representative may, however, order the placement of sheathing, shoring or bracing if, in his opinion, it is required to properly execute the work in accordance with these specifications. No additional compensation will be allowed for this operation.

For pipe diameters 18” and above, shoring, sheeting or trench shields shall be utilized in such a manner as to minimize disturbance of the bedding material beneath the pipe crown. Whenever possible, trench support should not extend below the pipe crown. If trench support is necessary below the crown, it should either be left in place or consist of steel sheets ¾” thick or less which can be extracted with minimal disturbance. Dragging of a trench shield at pipe grade should only be done when it is demonstrated that such practices will not disturb the bedding, such as with the use of a compaction shield (or cut out section) at the trailing edge of the shield. If a trench shield inadvertently slips below the pipe crown it should be raised vertically and granular embedment materials should be placed and compacted in the void created by the shield.

No actions or instructions by the City Engineer or his authorized representative shall be regarded as his responsibility for the security of the trench or protection of workmen. The full responsibility shall remain with the Contractor.

**624.03.4 - Dewatering.** The Contractor shall keep all excavations free from water at his own expense while pipe laying is in progress and to such extent as may be necessary while excavation work alone is being carried on. He shall provide for the disposal of the water removed from excavations in such manner as shall not cause injury to the public health, to public or private property, or to any portion of the work completed or in progress, or any impediment to the use of the streets by the public. No water shall be discharged into the sanitary sewer system.

**624.03.5 - Pipelaying.** Before sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared, the required bedding placed, and bracing and sheeting installed where required. Pipe trenches shall be kept free from water during pipe laying, joining or before sufficient backfill has been placed to prevent flotation of the pipe. The trench shall be excavated to the dimensions shown on the drawings. Trench bottoms found to be unsuitable for foundations after pipe laying operations have started shall be corrected and brought to grade with approved materials. Each pipe shall be accurately placed to the line and grade called for on the drawings.

Except as otherwise provided in these specifications, all pipe and fittings shall be installed in accordance with the manufacturer's recommendations. PVC pipe shall be installed in accordance with the pipe manufacturer’s installation manual. All sewer pipe and specials shall be carefully inspected before being laid and no cracked, broken and/or defective pipe or special shall be used in the work. Each piece of pipe shall be sounded before being placed in the line. The outside of the spigot, the inside of the bell, and any couplings used shall be brushed and wiped clean and dry and free from all foreign matter before the pipe is joined. No connection shall be made where joint surfaces and joint materials have been soiled by earth or embedment in handling until such surfaces are thoroughly cleaned.

The pipe and fittings shall be so laid in the trench that after the invert thereof shall conform accurately to the grades and alignment established by the construction drawings. At any stage of construction of a straight stretch between two consecutive manholes the zero or starting end of the pipe shall be clearly visible on looking through the pipe from the other end, with the full cross-section of the interior of the pipe in clear view.

After the pipe has been laid in the best material available from excavation in the immediate vicinity of where the pipe is being laid, the excavated material shall be used to backfill around and over the pipe in a manner specified in Subsection 624.03.8. For pipe diameters 18” and above, backfill material placed under the haunches shall be shovel sliced or compacted depending on class of embedment. If, in the opinion of the City Engineer or his authorized representative, material suitable for bedding the pipe is not available where pipe is being laid, suitable material may be ordered hauled in.

Each newly made joint will be inspected and if it is not found to be satisfactory, the last laid length of pipe shall be removed at once. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During the laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other method approved by the City Engineer or his authorized representative. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is completely dry.

Cutting of pipes for inserting fittings or closure pieces shall be done in a neat and workmanlike manner in accordance with instructions of the pipe manufacturer and without damage to the pipe.

Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill.

**624.03.6 - Sewer Service Lines.** New six-inch (6") diameter PVC sewer service lines shall be installed from the wyes in all existing and in all new sewer mains. They shall be installed from the main to the right-of-way of the new streets to replace each existing service line and each new service line. Additional services can be installed as indicated on the plans or as authorized by the City Engineer or his authorized representative. Unless otherwise directed or permitted by the City Engineer or his authorized representative, new service lines shall follow the line and grade of the existing service, which will, in most cases, ensure removal of the old services from the ground. All existing service lines shall be removed upon installation of the new service. Removal of existing service lines shall be included in the cost of the installation of the new service line.

The depth of the service line at the point of connection for each property owner shall be sufficient to permit connection to the existing private sewer lines at a minimum grade of one-eighth inch (1/8") per foot.

The Contractor shall verify house connections during excavation. The installation of new service lines to accommodate future development may be directed by the City Engineer or his authorized representative.

All sewer service lines shall join the main sewer at a wye. Wyes shall be placed at all existing service locations. When the installation of a service line connection to an existing PVC main is required by the City Engineer or his authorized representative, the use of an approved saddle type connection will be permitted. All metal parts on saddle type connectors must be stainless steel. Lateral connections to PVC profile wall pipe shall be Inserta-tee or approved equal.

New clean-outs shall be installed on all new service lines in accordance with the details on the plans. A brass clean-out plug with countersunk nut shall be installed at all clean-outs. Sewer clean-outs located in unpaved areas shall have a 24-inch by 24-inch by 4-inch thick concrete pad placed around the cleanout in accordance with the detail on the Drawings. In the event that a sewer clean-out location is in a driveway, parking lot, etc., the Contractor will install a cast iron clean out cover which shall be East Jordan Iron Works (EJIW) Model V-1610-1 or an approved equal.

Prior to installing storm drains, the Contractor shall verify sewer lateral locations and grades. Should a service tie-in conflict arise due to the new storm drain, the Contractor shall install additional sanitary sewer pipe to tie the services into. In the event that a sanitary sewer service conflicts with an existing or proposed storm drain line, the sewer service shall be rerouted over or under the storm drain, whichever will allow the proper flow from the clean-out to the main. This includes the lateral and parallel sewer if necessary. If rerouting is not possible, the Contractor shall contact the City Engineer or his authorized representative to discuss alternate methods to resolve the problem. This additional work shall be paid for under the line item for sanitary sewer main or service whichever is applicable. Any of the above additional work shall be subject to the approval of the Engineer.

Sewer service lines shall be connected to existing private lines at the property line with an approved adapter. Contractor shall notify the sewer customer when he will be changing out the sewer service line and approximately how long it will take. Lines installed for future use shall be plugged with an approved adapter, which can be removed without damage to the pipe bells.

The Contractor shall mark the face of the curb with an "S" stamped into the wet concrete where the curb is finished over the sewer service and shall keep construction records showing all lines, fittings, taps, etc., with sufficient data to accurately located these items after the trench has been backfilled. In the event of a failure, by the Contractor, to accurately locate all items listed herein, the Contractor will be held responsible in relocating these items at his own expense.

**624.03.7 - Connection to Existing Manholes.** When removing sewer lines, the Contractor shall break out the existing sewer at all manholes and grout a new gasket in the manhole wall. The new sewer pipe shall be installed after the grout has been given sufficient time to set up. The Contractor shall repair any damage done to the invert of the existing manhole at his own expense.

New manhole connections to precast concrete baes can be made with elastromeric gasket seals such as ALOK or Press Seal PSX. Connections to poured in-place manholes shall use manhole adapters or waterstops.

For pipe diameters 18” and larger connections to existing manholes shall be made by cutting a hole in the wall of the existing structure, inserting a length of PVC solid wall pipe into the hole, filing around the pipe with non-shrink grout, and troweling the inside and outside surfaces of the joint to a neat finish. New manhole connections to precast concrete bases can be made with elastomeric gasket seals such as ALOK or Press Seal PSX. Connections to poured in-place manholes shall use manhole adapters or waterstops.

**624.03.7.1 – Connection to Existing Pipes, Large Diameter Pipe.** Connections to existing lines shall be made by coupling a piece of PVC profile wall pipe to the existing line with an appropriate adapter by the pipe manufacturer.

**624.03.8 - Backfilling Trenches.** Backfilling shall be made with the material excavated from the trench provided that the excavated material is suitable for backfilling. Suitable materials shall be construed as material that will compact readily when the usual methods of mechanical tamping are used.

All backfill material shall be free from cinders, ashes, roots, refuse, vegetative matter, excess organic material, rocks, stones or other unsuitable materials.

All trenches shall be backfilled immediately after the pipe has been laid and inspected. Backfilling shall include the refilling and compaction of the fills in the trenches or excavation to the exiting ground surface or to the existing road subgrade.

Existing/native material shall be utilized as backfill wherever possible. In the event that existing material is unsuitable for backfill, borrow material may be used. This borrow material must be from a pre-approved source. The placement of borrow material must be approved by the City Engineer or his authorized representative. The excavation and disposal of unsuitable material shall be measured and paid for as Excess Excavation.

Where the depth of cover is twenty-five (25) feet or less, pipe bedding and backfill material within the pipe zone for 18” – 54” pipe shall be defined as that portion of the pipe zone which extends from 6” below the bottom of the pipe to a point 12” above the top of the pipe. Where depth of cover exceeds twenty-five (25) ft., the pipe zone shall extend to 18” above the top of the pipe. Prior to laying the pipe the foundation materials shall be trimmed to grade, such that each pipe section is fully supported along the entire length of the pipe barrel.

When backfilling within the pipe zone, special care shall be exercised not to cause settlement or lateral movement. To safeguard against movement of pipelines or structures, the Contractor shall place the backfill in small layers and shall thoroughly compact each layer with hand-operated, power-driven vibrating compactors to obtain the specified density.

All trenches shall be backfilled by hand or by approved mechanical methods from the bottom of the trench to a depth of one foot (1') above the pipe with fill placed in layers of six inches (6") and compacted by tamping to ninety-five percent (95%) density in accordance with ASTM D 1557, so as to ensure that the backfill is well placed and compacted beneath the haunches of the pipe. Backfilling material shall be deposited in the trench for its full width of each side of the pipe, fittings, and appurtenances simultaneously. Care shall be exercised to prevent distortion or damage to the pipe. The Contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving pipe.

From one foot (1') above the pipe to the grade shown on the drawings or specified herein, the trench shall be backfilled in layers which do not exceed eight inches (8") before compaction and shall be compacted with approved mechanical equipment to ninety-five percent (95%) density in accordance with ASTM D 1557, unless approved otherwise by the City Engineer or his authorized representative. Heavy compaction equipment shall not be used closer than 2 ft. to the top of the pipe.

The City Engineer or his authorized representative shall have the right to forbid the use of any compacting tools or machines that he considers dangerous to the pipe or incapable of compacting the backfill properly.

The Contractor shall take random density tests in the trench lines to assure that proper compaction has been achieved.

Where any sheathing or bracing is withdrawn as the backfilling progresses, all voids or spaces left thereby shall be carefully and thoroughly filled and compacted with properly shaped tools.

After completion of backfilling, all materials not used therein, including any excess excavation shall be removed and disposed of and all roads, shoulders, and other places in the line of work shall be left free, clean and in good order.

**624.03.09 – Pipe Tunnels and Casing.** The pipe should not rest on the bell as it is pushed into the casing. Casing spacers shall be used to raise and support pipe lengths in the casing. A casing spacer shall be aligned with the second assembly mark to prevent over-insertion into the bell.

**624.03.10 - Sewer Line Inspection.** The Contractor shall conduct an infiltration or air test for leakage as determined by the Engineer. Testing shall be conducted in accordance with all applicable safety standards. Infiltration shall not exceed twenty-five (25) gallons per twenty-four (24) hours per inch of diameter per mile of sewer. Contractor shall furnish all supplies, materials, labor, services, etc., needed to perform the test. No separate payment will be made for equipment, supplies, material, water, or services. Any leakage, including active seepage, shall be corrected where such leakage exists until the pipelines meet the requirements of the allowable leakage specifications. Infiltration tests shall be made when groundwater level is 18” or more above the top of the outside of the pipe.

Each section of sewer between two or more manholes shall be tested in accordance with ASTM F 1417, “Recommendation Practice for Low Pressure Air Testing of Installed Sewer Pipe.” If any test fails to meet the established requirements the cause shall be determined and corrected if necessary.

All new sewer lines shall be "lamped" between manholes. The Contractor shall provide mirrors, adequate battery operated lights and other necessary equipment and personnel to make this inspection.

All new PVC sewer lines shall be tested for diametric deflection by the Contractor at his expense using a GO-NO-GO type mandrel as manufactured by Hurco Technologies, Inc. or approved equal. The mandrel shall have an outside diameter of not less than ninety-five percent (95%) of the PVC pipe inside diameter. Deflection of PVC pipe after installation and backfill shall not exceed five percent (5%). Pipe found to be deflected more than five percent (5%) shall be replaced at the Contractor’s expense. This testing shall be accomplished prior to final acceptance and after all of the sewer pipe has been completely installed, backfilled, and in place for thirty (30) calendar days. For pipes >18”, mandrel shall be constructed of one-half inch (1/2”) thick angle iron and #4 steel bars (ASTMA-15) welded to steel pipe. The mandrel design shall be approved by the City Engineer or his authorized representative.

Upon completion of “lamping” and mandrel test, the Contractor shall video all new sewer mains and sewer services on the project after a minimum of thirty (30) calendar days from installation. The Contractor shall give a copy of the video to the City Engineer or his authorized representative for review and approval of the new sewer lines and services prior to the installation of road subbase. The Contractor shall make arrangements for the City Engineer or his authorized representative to be present to witness the “lamping”, mandrel test, and making of the video.

In the event that any imperfection in any of the new sewer lines or services is discovered during the ‘lamping”, mandrel test or review of the video, the Contractor shall correct the problem(s) immediately at his own expense. Once the Contractor believes the problem(s) has been corrected, the entire section(s) of pipe (i.e. manhole to manhole) containing the imperfection(s) shall be re-lamped, re-mandreled and re-videoed following all the same requirements as imposed for the original testing. This procedure shall be repeated until the pipe segment(s) is approved for acceptance by the City Engineer or his authorized representative. All cost incurred for correcting problems and re-testing shall be the responsibility of the contractor.

**624.03.10 - Parallel Installation.** All proposed sewer lines, sewer services and sewer force mains shall be laid at least ten feet (10') horizontally from any existing or proposed water main or service. The distance shall be measured edge to edge. Any deviations must be approved by the City on a case-by-case basis, if supported by field data.

**624.03.11 - Crossings.** Sewer services and sewer force mains crossing water mains or water services shall be laid to provide a minimum vertical distance of eighteen inches (18") between the outside of the water line and the outside sewer line. Special structural support for the water and sewer pipes may be required. Any deviation must be approved by the City on a case-by-case basis, if supported by field data.

**624.03.12 - Air Release Valve Installation.** The Contractor shall keep construction records showing the profile of the new force main. Air release valves shall be installed wherever the profile indicates a peak in the grade of the force main. Installation shall be in accordance with the details on the plans.

**624.03.13 – Force Main Pressure Tests.** The sections and complete sewer force main shall be subjected to pressure tests conforming with AWWA Standard C-600-87, Section 4 and shall successfully pass the leakage test as determined by the following formula:

L = SD(8.66)

133,200

Where:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

The test pressure shall be seventy-five pounds per square inch (75 psi). The duration of the test shall be at least four (4) hours

**624.04 - Method of Measurement.** Measurement for sewer items will be measured in place, by length in linear feet along the centerline of each line from the center to center of the intersecting line or to the farthest extent of terminal fittings with no deductions for valves, fittings, etc. Excavation, dewatering, backfilling, thrust blocks, PVC fittings, “Megalug” retainer glands shall be measured by the pound from the dimensions and shipping weights shown on the submittals and paid as ductile iron fittings in accordance with Special Provision 907-604-1. Ductile iron fittings will be measured by the pound in accordance with 907-604-1. Marking tape, locator wire, concrete clean-out pads, bypassing, sheathing and shoring will not be measured separately, but shall be absorbed as a part of the item of the sewer main furnished and installed.

Aggregate for pipe bedding, if ordered by the City Engineer or his authorized representative, will be measured by volume in cubic yards in accordance with 907-304-1 or 907-203-1.

If existing/native material is used as backfill, there shall be no additional payment for excavation and backfill. If existing material is unsuitable for backfill, borrow material may be used. This borrow material must be from a pre-approved source. Approved placement of borrow will be measured by volume in cubic yards in accordance with 907-203-EX. The excavation and disposal of the unsuitable material shall be paid for as Excess Excavation and measured by volume in cubic yards in accordance with 907-203-G.

The clean-outs shall be measured as linear feet of sewer service lines. Brass clean-out plugs will not be measured for separate payment but shall be included in the unit price bid for sewer service lines.

Stamping service line and valve locations in curb will not be measured for separate payment.

Standard and high traffic clean-out covers will be measured by the pound and paid as castings in accordance with Special Provision 907-604-1.

“Megalug” retainer glands shall be measured by the pound from the dimensions and shipping weights shown on the submittals and paid as ductile iron fittings in accordance with Special Provision 907-644-1. Ductile iron fittings will be measured by the pound in accordance with 907-644-1.

Ductile iron fittings will be paid for at the contract unit price per pound in accordance with 907-644-1, which shall be full compensation for completing the work. Standard or full size ductile iron fitting weights (in accordance with AWWA C110) were used to calculate the quantity listed in the bid proposal.

Bypass pumping, pressure testing, plugging and blocking will be considered subsidiary obligations of the Contractor and will not be measured for separate payment.

Air release valves will be measured per each complete in place. The manhole, casting, stabilizer aggregate, saddle, valve, one inch (1") and two inch (2") PVC pipe will not be measured separately, but shall be included as a part of the air release valve furnished and installed.

Mandrel testing, “lamping” and making video of new sewer lines shall not be measured for separate payment. The cost thereof shall be absorbed in the bid price per linear foot of new sewer line.

**624.05 - Basis of Payment.** This work will be paid for at the contract unit prices per unit specified, complete in place, which shall be full compensation for completing the work. Materials or work for which a pay item is not included and are necessary to complete the work under this section shall be furnished or performed and shall be considered incidental to the completed construction.

Payment will be made under:

907-624-A: \_\_\_" PVC SDR-26 Sanitary Sewer Main -per linear foot

907-624-B: \_\_\_" Ductile Iron Sanitary Sewer Main -per linear foot

907-624-C: \_\_\_" PVC Sanitary Sewer Force Main -per linear foot

907-624-D: \_\_\_" Ductile Iron Sewer Force Main -per linear foot

907-624-E: 6" PVC SDR-26 Sanitary Sewer Service -per linear foot

907-624-F: Air Release Valve -per each

907-624-G: \_\_\_\_” Large Diameter PVC Gravity Sanitary Sewer Main (PS-115) -per linear foot