

SECTION 925

VACUUM SEWER COLLECTOR, INTERCEPTOR AND FORCE MAIN FACILITIES

925.1 GENERAL: The construction items specified in this section are common to vacuum sewer facilities.

925.2 REFERENCES

925.2.1 American Society for Testing and Materials (ASTM) Standard Specifications, Latest Edition

C478 Standard Specification for Precast Reinforced Concrete Manhole Sections

D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

D1784 Standard Specification for Rigid Poly (PVC) Compounds and Chlorinated Poly (CPVC) Compounds

D2241 Standard Specification for Poly (PVC) Pressure-Rated Pipe (SDR Series)

D2564 Standard Specifications for Solvent Cements for Poly (PVC) Plastic Piping Systems

D2665 Standard Specifications for Poly (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

D2672 Standard Specifications for Joints for IPS PVC Pipe Using Solvent Cement

D3139 Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

925.2.1 This Publication, Latest Edition

SECTION 101 PORTLAND CEMENT CONCRETE

SECTION 102 STEEL REINFORCEMENT

SECTION 105 CONCRETE CURING COMPOUND

SECTION 106 CEMENT MORTAR AND GROUT

SECTION 108 BRICK

SECTION 121 PLASTIC PIPE

SECTION 161 GRAY IRON CASTINGS

SECTION 170 ELECTRONIC MARKER DISKS

SECTION 701 TRENCHING, EXCAVATION AND BACKFILL

SECTION 710 BOARING, DRILLING, AND JACKING

SECTION 801 INSTALLATION OF WATER TRANSMISSION, COLLECTOR AND DISTRIBUTION LINES

925.3 MATERIALS

925.3.1 PIPE: All buried vacuum collector lines, branch lines, force mains, vacuum service laterals, and gravity service stubs shall be SDR21 rated PVC pipe conforming to ASTM D 2241, ASTM D 1784 Cell Classification 12454-B. Pipe and appurtenances shall be new and unused.

925.3.2 JOINTS: All joints shall conform to ASTM D 2672, using solvent cement; or ASTM D 3139 using elastomeric seals. This pipe must be certified by the manufacturer that pipe and seal will operate at 24 inches of mercury vacuum and withstand a vacuum test at 24 inches of mercury vacuum with a maximum loss of 1% of initial vacuum per hour for a 4 hour period.

925.3.3 FITTINGS

925.3.3.1 Fittings shall be Schedule 40 solvent weld drain, waste and vent pipe per ASTM D 2665.

925.3.3.2 Wye fittings and 45° ells shall be used throughout; except that a long radius 3" 90° ell may be used on the 3" suction line entering the vacuum valve and at the wye connection of the vacuum service lateral to the vacuum main. Tee fittings and short radius ells are prohibited exclusively.

925.3.4 SOLVENT CEMENT: Shall conform to ASTM D 2564; primer and cement shall not be of same color. Cement shall be gray in color.

925.3.5 MANHOLE SECTIONS: Manhole sections used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall be reinforced precast concrete manhole sections, 48" nominal diameter, conforming to the requirements of ASTM C 478.

925.3.6 MANHOLE JOINTS: Tongue and groove in precast wall; shall conform to Section 920, PRECAST CONCRETE MANHOLES.

925.3.7 MANHOLE FRAMES AND COVERS: Frames and covers for manholes used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall conform to this Publication, Section 161.4. The words "SEWER" shall be cast on the manhole cover.

925.3.8 CAST-IN-PLACE CONCRETE: Cast-in-place concrete used for footings, flotation collars, grade-level pads, mass concrete for buffer tanks, and other installations not otherwise addressed shall be air-entrained concrete in accordance with Sections 101, 102, and 105 of this Publication, with a compressive strength of 3500 psi. Type II Portland cement shall be used for all applications where the concrete will be in contact with sewage. See Section 1502, SUBMITTALS.

925.3.9 VALVES: Valves used for pig launchers and

vacuum division valves shall be mechanical joint gate valves conforming to Sections 801.3.3.1 through 801.3.3.9 of this Publication. Vacuum division valves shall be equipped with five-sided nuts, sockets and extension bars per Standard Drawing 2169.

925.3.10 AIR RELEASE VALVES: Air release valves shall be APCO or approved equal, the model number per the construction drawings.

925.3.11 VACUUM VALVES AND APPURTENANCES: Vacuum valves shall be per the construction drawings. Furnish all mechanical appurtenances required for a complete installation per manufacturer specifications. Vacuum valves and appurtenances are to be delivered to the OWNER's warehouse, unloaded, and stored as directed by the ENGINEER in complete packages.

925.3.12 VACUUM VALVE PITS

925.3.1.2.1 Vacuum valve pits shall be either "standard" or "deep" per the appropriate bid item.

925.3.1.2.2 The standard valve pit shall have a sump 30" deep and shall be per the construction drawings. The deep valve pit shall have a sump 54" deep and shall be per the construction drawings.

925.3.13 STAINLESS STEEL: Stainless steel for brackets and fasteners shall be AISI Type 304.

925.4 SUBMITTALS

925.4.1 The following shall be submitted for the ENGINEER'S approval prior to incorporation in the work of the corresponding item:

- a) Concrete Mix Design(s)
- b) Material and method of sealing pipe penetrations in buffer tank walls
- c) Pipe certification for vacuum service

925.4.2 The OWNER/ENGINEER will be supplied with a certificate of compliance for each item or type of material required in the system, as to that item meeting the specifications and/or the reference specifications before that item is installed.

925.4.3 The following records shall be maintained by the CONTRACTOR, shall be kept available at all times for inspection by the ENGINEER, and shall be submitted to the ENGINEER at his request or as provided in these Specifications.

925.4.3.1 Vacuum tests performed daily or as otherwise stipulated. These tests shall be recorded on

charts provided by the OWNER or in hard-board notebooks as stipulated herein depending on the type of test.

925.4.3.2 Record Drawing markups and related survey notebooks kept current by the CONTRACTOR to record work performed and to reflect any and all revisions made from the original drawings.

925.5 INSTALLATION

925.5.1 GENERAL

925.5.1.1 Handle pipe and appurtenances in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken to prevent damage to any coating.

925.5.1.2 Prior to installation, store plastic pipe and protect from prolonged periods of sunlight per Section 121.

925.5.1.3 The interior of the pipe, pits, and all appurtenances shall be thoroughly cleaned of foreign material before being lowered into the trench and shall be kept clean during construction operations.

925.5.1.4 Install a plug in the new system at any point of connection to an existing system. The plug shall remain in place until the ENGINEER and OWNER authorize its removal in writing. The CONTRACTOR shall not flush or otherwise discharge any flow into an existing system unless approved in writing by the ENGINEER.

925.5.1.5 Perform trenching, backfilling, and compaction in accordance with Section 701.

925.5.2 PIPE INSTALLATION

925.5.2.1 All vacuum sewers shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. All pipe which has been designed to slope downward shall slope uniformly downward, with a tolerance of no more than 0.01' per 20 feet of line. Abrupt sags or bellies will not be permitted. The elevation of each joint of pipe shall be recorded by the CONTRACTOR in bound field books which shall be submitted to the ENGINEER.

925.5.2.2 All sanitary sewer force mains shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. Particular care shall be taken to avoid crests in the profile at locations other than those shown on the drawings. Elevations shall be recorded by the CONTRACTOR at 100-foot intervals, and at each change in grade, in bound field books which shall be submitted to the ENGINEER.

925.5.2.3 Handle and install pipe and fittings in accordance with manufacturer's recommendations.

925.5.2.4 Prevent entrance of dirt or foreign matter or damage to pipe lining or coating. Plug the pipe any time work is stopped.

925.5.2.5 No defective pieces are permitted. Defective pieces discovered after use will be removed and replaced with a sound piece.

925.5.2.6 Place bedding, embedment and backfill in accordance with Section 701 unless otherwise indicated on the drawings. The bedding of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. Suitable excavation shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to the line and grade shall be made by scraping away or filling in with pipe zone material under the body of the pipe, but not by wedging or blocking. When connections are to be made to any existing pipe, valve pit, or any other improvement, the actual elevation or position of which cannot be determined without excavation, excavate and expose the existing improvement before laying the connecting pipe or conduit. When existing underground improvements may reasonably be expected to conflict with the line or grade established for the new sewer line, the ENGINEER shall request the CONTRACTOR to excavate as necessary to expose such potentially conflicting underground improvements prior to laying the new pipe. Any adjustment in line or grade which may be necessary to accomplish the intent of the plans will be made, and the CONTRACTOR will be paid for any additional work resulting from such change in line or grade in the manner provided for in the GENERAL CONDITIONS.

925.5.2.7 Lay pipe upgrade in a continuous operation from structure to structure, with the socket ends of the pipe upgrade unless otherwise permitted by the ENGINEER.

925.5.2.8 Sanitary sewer mains shall not be constructed under walkways, sidewalks, curbs and gutters, drive pads, or similar concrete structures by tunneling underneath them. Cut concrete by using a concrete saw or, at the CONTRACTOR'S option, remove the entire section of concrete to the nearest full expansion joint or edge.

925.5.2.9 Place and hand-tamp fill to 95% of maximum dry density per ASTM D 1557, in entire space between the pipe or fitting and the trench walls.

925.5.2.10 Prior to completely backfilling the sewer excavation, install a green metalized plastic

tracer/warning tape 12" to 18" below finished grade.

925.5.2.11 Mark the ends of all wyes, branch lines, and gravity service stubs that are installed for future connections to the system. Attach a stainless steel marker with stainless wire to the stubout end and place the marker within 8" to 12" of finished surface for future relocation of stubout.

925.5.2.12 Provide pipe through casing with support skids as shown on the drawings and Standard Drawing No. 2380. Alternate support methods may be acceptable upon ENGINEER'S review and approval.

925.5.3 DIVISION VALVE AND GAGE TAP INSTALLATION: Division valves, vaults, and gage tap assemblies shall be installed per Standard Drawing No. 2170.

925.5.4 VACUUM VALVE PIT INSTALLATION

925.4.4.1 Install complete vacuum valve pits in accordance with manufacturer instructions and Standard Drawing No. 2165. Perform pressure testing on each valve pit assembly per the manufacturer instructions.

925.4.4.2 Stubouts for the gravity line from the collection sump should be 4" diameter, extended to the property line unless otherwise indicated. Each stub-out should have a stop glued in place 4" to 6" from the end inserted into the tank, to prevent it being pushed too far into the collection sump. A solvent welded 4" cap should be fitted and glued to each stub-out to prevent rocks and groundwater entering the sump prior to connection of the house gravity line. Expandable test plugs or rubber caps are not acceptable as temporary covers for gravity stub-outs.

925.5.5 SINGLE OR DOUBLE BUFFER TANK INSTALLATION

925.5.5.1 Install single or double buffer tank as shown on the drawings and Standard Drawing 2167 (single) or 2168 (double).

925.5.5.2 All pipe penetrations through the buffer tank walls shall be water tight. Submit manufacturer's literature on material and technique for sealing to the ENGINEER.

925.5.5.3 Install suction and sensor pipes as shown on the Standard Drawings. Attach these lines to the buffer tank side walls using Type 304 stainless steel brackets and fasteners. The 3" service lateral is to be stubbed into the buffer tank and capped or otherwise sealed until the vacuum valve is installed.

925.5.5.4 Install breather pipe through buffer tank

wall as shown on Standard Drawing No. 2166. This line is to be capped or otherwise sealed to prevent any infiltration of water during construction. It shall be tested in accordance with Breather Test Procedure, Paragraph 925.8.

925.5.5.5 Buffer tanks shall be tested after assembly. The entire buffer tank shall be tested as follows:

925.5.5.5.1 Stubouts, manhole boots, and pipe plugs shall be permanently secured to prevent movement while the vacuum is drawn.

925.5.5.5.2 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.5.5.5.3 Using CONTRACTOR furnished vacuum pump and gage, establish a measured vacuum of 10 inches of mercury in the buffer tank. Record the time for the vacuum to drop to nine inches of mercury.

925.5.5.5.4 The maximum allowable leakage rate for a four foot diameter manhole shall be in accordance with the following:

Min. Elapsed Time for a Pressure <u>Manhole Depth Change of 1" Hg</u>
10' or less 60 seconds
>10' but <15' 75 seconds
15' but <25' 90 seconds

925.5.5.5.5 If the buffer tank fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the tank passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the ENGINEER. Leaks shall be repaired on the outside of the manhole unless otherwise approved by the ENGINEER.

925.5.5.5.6 If a buffer tank joint mastic is pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

925.5.5.5.7 Record test results on a calibrated chart recorder as described in Section 925.6, Field Quality Control.

925.5.6 INSTALLATION OF CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN: Casing for sanitary sewer vacuum main or force main shall be per the drawings and Standard Drawing No. 2380 and per Section 710 of this Publication.

925.6 FIELD QUALITY CONTROL

925.6.1 Provide daily testing of all sewer mains and

lateral connections laid. Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings. Using OWNER-furnished vacuum pump and chart recorder, apply a vacuum to 24 inches of mercury to the pipes with pump running continuously for 15 minutes to allow vacuum to stabilize before proceeding with test. There shall be no loss in excess of 1% of initial vacuum per hour for a two hour test period. As pipe is laid the new section shall be tested in addition to the previously laid pipe on that main.

925.6.2 Leave uncovered the sewer main pipe joints until after the daily vacuum test is complete so that any leaks can be easily located and repaired. Exposed joints shall be adequately restrained.

925.6.3 Two hour Vacuum Line Test Modification Provision: If the CONTRACTOR succeeds in meeting the daily 2-hour test for seven consecutive working days or two thousand feet of pipe, the ENGINEER may amend the procedure to allow the trench to be covered as work progresses rather than the trench being kept open all day as is the norm with the daily 2-hour test. Should a line fail the vacuum test while utilizing this test modification, the CONTRACTOR shall take whatever action is necessary at his cost to pass the test including the excavation of the trench, leak detection and line repair, and additional cleanup as required by the ENGINEER. After the failure, the CONTRACTOR must re-qualify as specified above. Note this test modification is optional, and as such, the CONTRACTOR assumes all liability in its use. Allowance of this modification by the ENGINEER is not considered acceptance of the sewer line or ability to withstand test vacuum pressures.

925.6.4 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.6.5 Required Final Acceptance Testing on complete system: Provide 48 hours notice to ENGINEER prior to test. Ensure all division valves are open prior to beginning of test. Subject the entire sewerage system to a vacuum of 24 inches mercury, and allow to stabilize for 15 minutes before proceeding with test. There shall be no loss greater than 1% of initial vacuum per hour over a four hour test period.

925.6.6 All daily testing and Final Acceptance Test shall be recorded on vacuum charts to be provided by the ENGINEER. These charts will not be considered valid unless witnessed by ENGINEER on test equipment at beginning and end of vacuum test period.

925.6.7 The ENGINEER will sign and date charts to verify witness of tests. This signature does not indicate acceptance of the system.

925.7 LINE FLUSHING

925.7.1 After acceptance testing, flush lines to remove debris and foreign materials that accumulated in the lines during construction.

925.7.1.1 Suggested procedure (This procedure requires the use of vacuum valves, coordination of installation by the OWNER is the responsibility of the CONTRACTOR):

925.7.1.1.1 Place system under vacuum to 24 inches mercury.

925.7.1.1.2 Add water to valve pits at extreme ends of system and cause vacuum valves to operate and draw water into piping system.

925.7.1.1.3 Utilize system vacuum to transport the water and debris to collection point. Continue procedure until water entering at collection point is free of contamination or debris. If vacuum station collection tank is used as collection point, monitor volume of liquid in tank and pump out as necessary by means other than system sewage pumps. After completion of flushing, clean collection tank of all collected debris.

925.7.1.1.4 Restore vacuum collection tank and collection system to permanent configuration and make ready to place into operation.

925.7.1.2 Alternate flushing procedures are subject to ENGINEER'S review and approval.

925.8 BREATHER TESTING

925.8.1 After entire breather assembly is complete from the above ground flexible extension to the interior of the valve vault or buffer chamber, it shall be pressure tested as follows:

925.8.1.1 Fabricate a test pipe using 3/4" PVC materials or approved equal; one end to be 3/4" male pipe thread, the opposite end to terminate with a 1/8" tubing connection.

925.8.1.2 Remove breather dome and install the test pipe in its place. Pressurize the breather assembly to a minimum 40" water gage as measured with a magnehelic gauge. The assembly shall remain at a constant pressure with no detectable leaks for a minimum of one minute in the presence of the on site inspector. A dated record of all testing of breather domes shall be maintained in a bound notebook, which shall be turned over to the ENGINEER upon completion of all work.

925.9 MEASUREMENT AND PAYMENT

925.9.1 SANITARY SEWER FORCE MAIN WITH BEDDING

925.9.1.1 Measurement shall be per linear foot measured horizontally along the centerline of pipeline and fittings from the collection/lift station interface to the point of discharge as shown on the construction drawings. No deduction from the total will be made for intermittent installations such as division valves, pig launchers, and associated manholes.

925.9.1.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material; restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; air and hydrostatic pressure testing; and all other labor, material, and equipment incidental thereto.

925.9.2 SANITARY SEWER FORCE MAIN PIG LAUNCHER

925.9.2.1 Measurement of installed pig launcher shall be per each unit installed as shown on the standard drawing.

925.9.2.2 Payment for the pig launchers will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all fittings, flanges, restraining glands, and harnesses; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; furnishing and installing resilient seat gate valves; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.3 BORE AND JACK, CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN

925.9.3.1 Measurement shall be per linear foot, measured horizontally along the centerline of the encasement pipe actually installed for the work accomplished as shown on the standard drawing and on the drawings.

925.9.3.2 Payment will be in accordance with the unit price per linear foot as defined in the Bid Proposal, and shall include: trenching, unclassified excavation, backfilling, and compaction; furnishing and installing bored steel casing, casing insulators, and casing end seals; repair and replacement of existing roadway, bridge abutments, utilities, or any other structures damaged during boring and jacking operations; removal and disposal of waste material; providing grout for backfilling; inspections or permits; and all other labor, material, and equipment incidental thereto; except that the carrier pipe will be paid for under the appropriate bid item for vacuum main or force main.

925.9.4 SANITARY SEWER AIR RELEASE VALVE

925.9.4.1 Measurement shall be per each air release valve installed as shown on the drawings and the standard drawings.

925.9.4.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing air release valve with all necessary fittings and appurtenances; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.5 VACUUM SEWER DIVISION VALVES AND VAULT

925.9.5.1 Measurement shall be per each vacuum sewer division valves and vault installed as shown on the drawings and the standard drawing.

925.9.5.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing resilient seat gate valve with all necessary fittings and appurtenances; furnishing the OWNER with one five sided extension socket with 6-foot long T-handle extension bar for every five valves installed; furnishing and installing the gage tap assembly consisting of rubber tubing, fittings, supports, tapping saddle, and all other appurtenances for measuring vacuum in vacuum main; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and

compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.6 VACUUM SEWER BUFFER TANK

925.9.6.1 Measurement shall be per each installed buffer tank (single or double per the respective bid item) as shown on the drawings and the standard drawings.

925.9.6.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment, including pipe and breather connections, breather vent piping and flexible breather pipe assembly; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing all fittings, pipe, and all appurtenances; connection of the new or existing sanitary sewer gravity lines including drilling precast manhole sections, gaskets, sealants, and grout; furnishing and installing concrete grout for shelf; air and vacuum testing as required; and all other labor, material, and equipment incidental thereto.

925.9.7 INSTALLING VACUUM VALVE PIT

925.9.7.1 Measurement shall be per each vacuum pit (standard or deep, Type A or Type B per the respective bid item) installed as shown on the drawings and the standard drawings.

925.9.7.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment including unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions including fencing, landscaping, and all other obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings and concrete anti-flotation collar; installation of flexible breather pipe assembly and all appurtenances; stubouts for connection of gravity and vacuum lines; air, vacuum, and all other testing as required; and all other labor, material, and equipment incidental thereto.

925.9.8 VACUUM COLLECTION LINES AND VACUUM SERVICE LATERALS

925.9.8.1 Measurement of vacuum collection lines and vacuum service laterals shall be per linear foot measured horizontally along the centerline of pipeline

as shown on the drawings.

925.9.8.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; field quality control testing including daily vacuum testing of lines using OWNER furnished trailer mounted vacuum pump, breather testing, and all other testing required; making all required submittals; and all other labor, material, and equipment incidental thereto.

925.9.9 VACUUM VALVES AND APPURTENANCES: Measured and paid for per each as a separate pay item as included in the associated Vacuum Pit or Buffer Tank as specified and provided in the Bid Proposal.